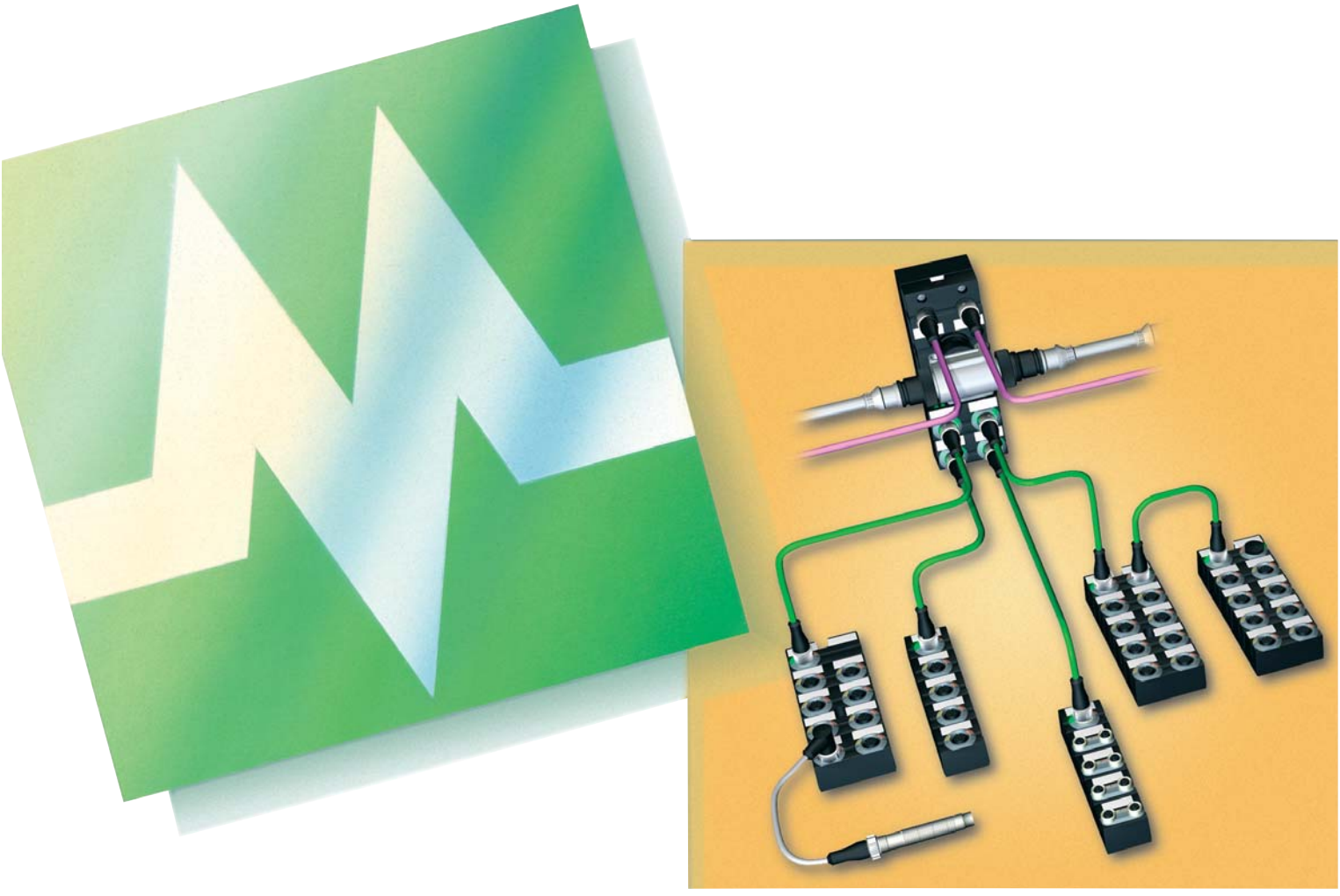
MURR ELEKTRONIK

Handbuch
Manual
Manuel

Cube67 BN-P



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Bus Manual:
General explanations and functions for each bus.

On this subject, please click on the links to the next page.

IO-Link:
General explanations and functions for IO-Link.

On this subject, please click on the links to the next page.

System Manuals:
Describe the system in general and give an overview about the products, accessories and documentation.

Art. No.	Designation
56030	Cube 20 System
56970	Cube 67 System
56974	Cube 67+ System

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Bus Node Manuals:
Describe product-specific features and settings to the Bus Node and to the modules which are connected to it.

Art. No.	Designation
56521	Cube67+ BN-Profibus
56980	Cube67 BN-Profibus
56981	Cube67 BN-DeviceNet
56982	Cube67 BN-CANopen
56983	Cube67 BN-Ethernet / IP
56984	Cube67 BN-DeviceNet V2

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Technical Data Manual:
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56971	Technical Data of devices of range Cube67 and Cube67+

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Instruction to Safetycategory 3:

Art. No.	Designation
56972	Instruction to Safetycategory 3

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Here are links to the bus user manuals:

>>> PROFIBUS (www.profibus.com)

>>> IO-Link (www.io-link.com)

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Chapter Overview

The “ Safety Instructions” section must be read without fail prior to working with the products and the system. This section contains information required for safe installation and handling.

The “ Configuration Information” section directs itself to system planners. It provides important information and details relevant to successful configuration.

The chapter “ Assembly and Wiring” provides detailed information on mechanical and electrical installation of the Cube67 BN-P bus node.

The chapter “ Setup” is directed towards specialist personnel responsible for startup. It gives important information for quick and easy startup of Cube67 in a Profibus-DP network.

The chapter " Diagnostics" describes visual diagnostic displays and the structure of Profibus diagnostic data.

The chapter “ Extended Functions” describes the additional functions available from 3.00 firmware.

The chapter “ Module” gives a short description of the format for the I/O data and the configuration of the individual I/O modules.

1. Safety Instructions

1.1 Explanation of Symbols

1.1.1 Use of Attention Signs

Important information is specially marked. The symbol is:

Text……..

1.1.2 Hazard Warnings

Hazard warnings are additionally marked in red.

CAUTION!

Disregard of safety measures may result in damage to equipment and other serious consequences.

DANGER!

Non-compliance with the relevant safety measures poses a danger to the health and life of the user.

1.1.3 Use of Numbering in Illustrations

Illustrations are numbered.

Example:
1. Text 1……
2. Text 2……
3. Text 3……

The explanations are given directly under the illustration concerned.

1.1.4 Use of Handling Instructions

Handling instructions describe the sequence of steps during installation, startup, operation, and maintenance that must be strictly observed.

They are numbered consecutively, with black numbers in white circles.

Example:
① Instruction 1…….
② Instruction 2…….
③ Instruction 3…….

1.1.5 Use of Footnotes

Comments are marked by superscript figures (example: text text [1]) text text). They are explained in the form of footnotes under the tables or at the bottom of the page.

1.2 Designated Use

The devices described in this manual serve as decentralized I/O modules for connection to a ProfiBus DP network.

The products described in this manual

- were developed, manufactured, tested, and documented in compliance with the relevant safety standards. The equipment poses no danger to operating personnel or material if configuration, assembly, and operation are performed in compliance with the handling and safety instructions.
- They meet the following requirements:

- EMC directive (2004/108/EG)

- DIN EN 61131-2 „Speicherprogrammierbare Steuerungen-Teil 2: Betriebsmittelanforderungen und Prüfungen“

- The products are designed for use in industrial environments. A characteristic of the industrial environment is that loads are not directly connected to the public low voltage system. Extra precautions are required for use in residential, business, and commercial applications.

WARNING!

This equipment has a Class A rating and can cause radio frequency interference in residential areas. In such cases, the operator can be asked to take appropriate precautions.

Troublefree and safe functioning of the product can only be assured through proper transportation, storage, installation, assembly, and operation with proper care and attention.

The intended operation of the equipment is only guaranteed with complete installation of the housings.

All power supplies connected to this device have to meet the EN 61558-2-4 or EN 61558-2-6 requirements.

System configuration, installation, startup, maintenance, and testing of devices may only be performed by an accredited, trained electrician familiar with automation technology safety standards.

The accident prevention and safety regulations valid for the specific application must be followed during the configuration, installation, startup, maintenance, and testing of the devices.

Only cables and accessories are allowed that meet the requirements and regulations for safety, electromagnetic compatibility and, where applicable, telecommunication transmission equipment and specifications.

Information regarding cables and accessories approved for installation can be obtained from your Murrelektronik branch office, or may be found in this manual.

1.3 Qualified Personnel

The requirements for qualified personnel are based on requirement profiles defined by ZVEI and VDMA.

Weiterbildung in der Automatisierungstechnik

Publisher: ZVEI and VDMA

Maschinenbau Verlag

P.O. Box 71 08 64

D-60498 Frankfurt

Only qualified electricians that are familiar with the contents of this manual may install and service the products described.

These are persons who:

- because of their specialist training, knowledge, experience, and because of their knowledge of the relevant standards, are capable of assessing the work to be done and possible dangers involved.
- because they have worked in the same area for many years, have the level of knowledge equivalent to a technical training.

Only Murrelektronik specialists may modify the hardware or software of its products, if these modifications are not explained in this manual.

WARNING!

Unqualified intervention in the hardware and software or disregard of the warnings provided in this manual can result in severe injury or serious damage to man and material.

2. Configuration Information

This chapter contains information required for successful installation of our system in a ProfiBus-DP network. General information independent of field bus relevant to configuration, installation, and operation of the Cube67 system can be found in the manuals:

Cube67 – System Manual , Art.-No. 56 970

Cube67 – Technical Data , Art.-No. 56 971

2.1 Cube67 in a ProfiBus-DP Network

The Cube67 system is a modular I/O system for decentralized gathering and control of digital and analog process variables. It consists of a fieldbus specific bus node and I/O modules that are independent of the fieldbus and are connected to the bus node via an internal system connection.

2.1.1 Components

A ProfiBus-DP network consists of at least the following components:

- one or several bus masters.
- one or several slaves.
- ProfiBus cables and plugs for connecting the of slaves
- one or several bus segments that are connected via a repeater.

2.1.1.1 ProfiBus Cables

Use only cables type A according to EN 50 170 part 8-2. Cable type B is obsolete and should no longer be used.

Parameter	Cable type A
Impedance level / Ω	135 to 165 at a frequency of 3 to 20 MHz
Operating capacity (pF/m)	≤ 30
Loop resistance (Ω/km)	≤ 110
Wire diameter (mm)	> 0.64
Wire cross section (mm^2)	> 0.34

The wire cross section used must fit the connection options on the bus connector.

2.1.2 General Information for Planning a ProfiBus Network

Up to 32 ProfiBus stations are allowed in one segment (including repeaters[1]).

According to the selected baud rate, the extension of a ProfiBus segment must not exceed the max. recommended values as listed in chapter 3.1.5 (table 3-1).

Repeaters can be used to divide a network into several segments. So it is possible to operate more than 32 stations in an extended ProfiBus network. However, signal delays resulting from the installation of repeaters must be considered during configuration of the system. Up to 9 repeaters can be installed between two stations.

[1] Art.No. 56960 Cube67 R-P M12

2.1.3 Topology

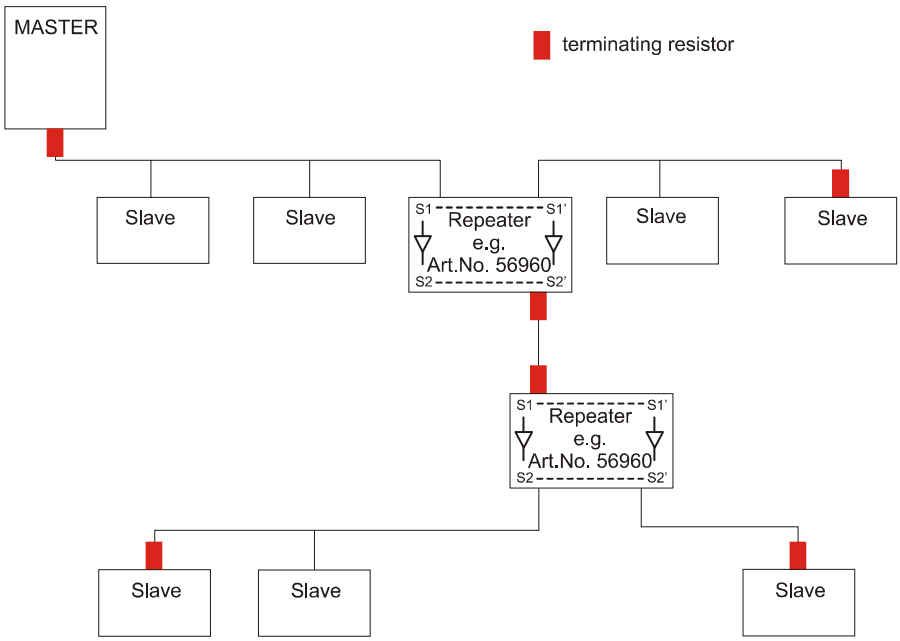


Fig. 1: Example: Structure of a ProfiBus network

2.1.4 Termination of ProfiBus segments

Both sides of a segment must be fitted with a terminating resistor. In order to ensure a physically clean signal level the terminating resistors have to be supplied with voltage.

The terminating resistor is either located in the connector or integrated into the device. In both cases it must be observed that in case of failure or application-related voltage cut-off the station at the end of a segment, the terminating resistor may also be switched off, thus interfering with the whole segment.

Therefore it may be useful to install the bus master at the beginning or the end of a segment. If the master fails, it does not matter whether the terminating resistor is supplied. Additional repeaters or externally supplied terminating resistors can be used to reliably terminate the other side of the segment.

The need of additional measures must be determined for every specific case.

Fig. 1 shows an example of correct termination in a typical ProfiBus network.

2.1.5 Baud Rate

All components in a ProfiBus network operate with one standard baud rate that is preset by the bus master. The Cube67 bus node automatically identifies the preset baud rate.

Depending on the baud rate used the following max. permissible cable lengths acc. to table 3-1 have to be observed. The values apply to one segment each. By means of repeaters longer network expansions with several segments can be created.

Baud rate in kBit/s	9.6	19.2	45.45	93.75	187.5	500	1500	3000	6000	12000
Cable length in m	1200	1200	1200	1200	1000	400	200	100	100	100

Tab. 1: Max. permissible cable lengths in a ProfiBus segment

2.1.6 Address

Permissible addresses for ProfiBus stations range from 0 to 125. The two adress switches of the Cube67 bus node allow setting addresses from 0 to 99.

An unambiguous address has to be assigned for each station in a ProfiBus network. The address is set at the Cube67 bus node via two BCD rotary switches that are integrated into the base module.

The address will be read in after a power reset. It is not possible to change the address during operation.

For detailed information please refer to the Cube67 System Manual.

2.1.7 Stub Lines

Passive stub lines should be avoided.

If stub lines cannot be avoided, because a temporary connection to a programming or diagnostic device is required, active stublines or repeaters should be used. Correct termination must always be assured.

2.1.8 Installation Guideline

The ProfiBus users association (PNO) has issued an installation guideline. In addition to the data of the Cube67 manuals, this guideline must be followed. The installation guideline is available from the PNO.

www.profibus.com

3. Assembly and Wiring

For information on installation and wiring of I/O modules and the internal system connection please refer to Cube67 – Technical Data.

In this chapter you will only find information on the wiring of the bus node connection. For the complete wiring of the bus node please refer to the manual “Technical Data”.

CAUTION!

During assembly, wiring, and setting of the ProfiBus address the equipment must not be under power.

3.1 How to Connect the ProfiBus

Initial conditions

- The module has to be disconnected.

Required tools

- Insulation tool, screwdriver, and a special tool in case no pre-wired cables are used. Tool for tightening the hexagonal screw (Murrelektronik torque wrench M12, art. no. 7000-99102-0000000).

Connection of ProfiBus Cable

① Insert the plug of the ProfiBus connector into the corresponding socket of the bus node. Make sure that the coding fits exactly and that the plug is locked in the socket.

② Screw down the plug with the hexagonal screw.

Bus In	Bus Out
BUS IN	BUS OUT

Contact No.	Signal	Meaning
1	VP	Supply voltage Plus, (P 5 V)
2	RxD/TxD-N	RxD/TxD–N, A cable (green)
3	DGND	Data transmission potential (reference potential to VP)
4	RxD/TxD-P	RxD/TxD–P, B cable (red)
5	n.c.	-
Thread	Shield	Shield or protective earth

Fig. 2: Pin assignment ProfiBus M12 sockets (B-coded)

The shield should preferably be applied over the surface of the thread.

3.2 Connecting the Terminating Resistors

Both sides of a ProfiBus segment must be fitted with a terminating resistor. In case of a Cube67 bus node, the terminating resistor must be installed on the socket of the ProfiBus interface of the cap.

Art. no.	Description
55356	Terminating resistor ProfiBus-DP
58 627	M12 blind plugs (quantity 10 pcs.)

Initial conditions

- The terminating resistor must be screwed down while the system is not under power.
- The bus node is located at the beginning or at the end of a ProfiBus segment.

Required tools

- A tool may be required for tightening the hexagonal screw.

Connecting the Terminating Resistors

① Insert the terminating resistor into the socket of the extension ProfiBus interface of the cap. Make sure that the coding fits exactly and the plug is locked in the socket.

② Tighten the terminating resistor using the hexagonal screw.

4. Setup

4.1 GSD File

The operation of the equipment described in this manual requires a GSD file

MURR064D.*

The suffix of the file indicates the language version. The GSD files are available in six languages.

Language	Suffix
*.gsd	Default = English
*.gse	English
*.gsg	German
*.gss	Spanish
*.gsf	French
*.gsi	Italian
*.gsp	Portuguese

The GSD file can be downloaded from

www.murrelektronik.de

or supplied by your Murrelektronik branch office.

4.1.1.1 Operating a Bus Node SW version 1 with Latest GSD File

Please observe the following when operating a Cube67 bus node and I/O modules Version 1 with the latest GSD file:

- Use only the following I/O modules:

Art.No.	Description
56600	DIO16 C 8xM12
56610	DIO8 C 4xM12
56620	DIO8 C 8xM8

- Up to four I/O modules can be connected to a bus node.
- You must not use “preconfigured” versions of an I/O module (see Chapter Configuration with Preconfigured Modules).

4.2 Assigning and Setting the ProfiBus Address

The ProfiBus address is set by means of two BCD rotary switches directly at the Cube67 bus node. Allowable values are between 0 and 99.

The preset address will be read in after the supply voltage is connected. Therefore, a change of the address will only become effective after a voltage reset of the module.

When assigning the address it must be ensured that each ProfiBus device gets a clear and individual address.

4.3 Configuration

Note:

The Cube67 system is usually configured with the help of a configuration tool provided by the manufacturer of the master. In this case you can disregard the technical details described in this chapter. For examples please refer to chapter " Configuration Examples".

The master sends the configuration telegram to the slave while the system is booted and defines the number of input and output bytes.

Cube67 uses the special identifier format according to IED 61158.

Cube67 can only be operated with DP masters that support the special identifier format.

With the help of this information the Cube67 bus node checks the installation for compliance with the projected configuration. If the bus node detects a deviation between the nominal configuration transfered by the DP Master and the physical configuration, the bus node reports a configuration error message (parameter error message) and does not exchange data with the DP Master.

A configuration or parameter error is displayed at the bus node by the LED "Cfg F". If there is a failure the LED "Cfg F" will light up red.

4.3.1 Placeholder

Placeholders can be added in order to easily extend the Cube67 system. A placeholder is a module with a data length of zero, serving only to reserve a space for a module to be added later.

Note:

We recommend inserting placeholders into unused sockets in the configuration. See chapter " Configuration Examples".

Slot 17 can only be used for a virtual module. A placeholder is no virtual module, as it is used instead of a physical module.

4.3.2 Replacing DI Modules by DIO Modules

Two versions of digital I/O modules are available:

- DIO : Each channel can be configured as input or output
- DI : Each channel is an input

DIO modules support all the functions of the corresponding DI modules. Therefore, it is possible to replace a DI module by a DIO module without modifying the ProfiBus configuration.

This option reduces inventory and allows installing cost-effective DI modules for basic equipment.

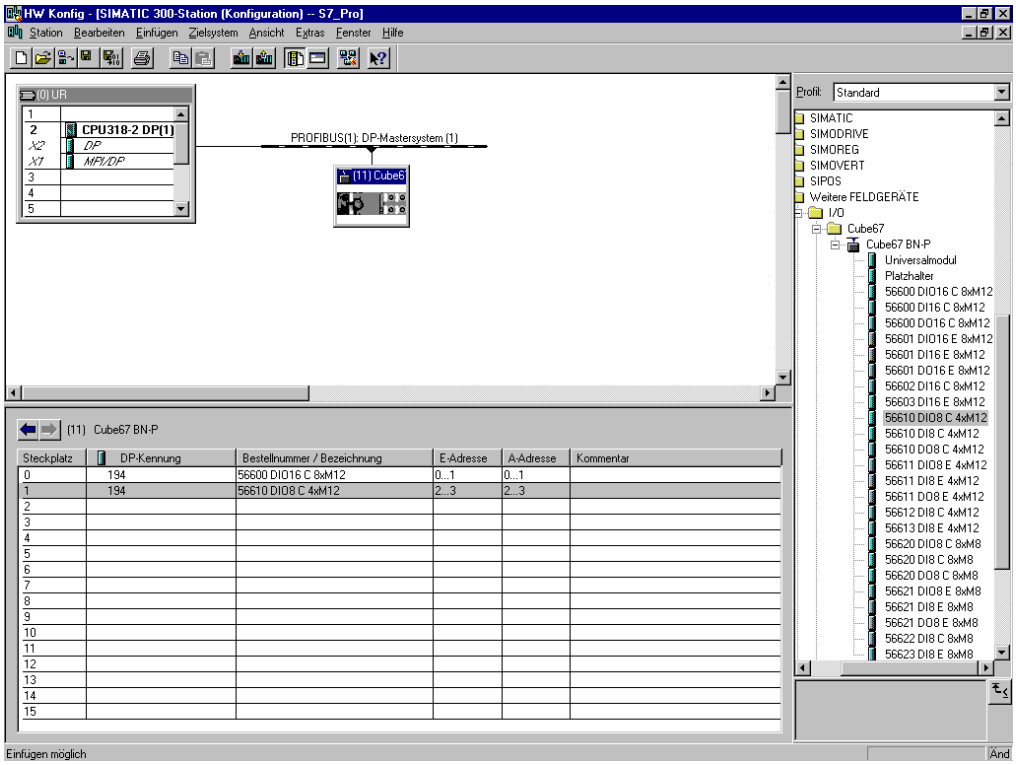
If you replace an installed and configured DI module by a DIO module, the bus node will recognize this and assure via the integrated replacement algorithm that it behaves like a DI module for the DP master and the application.

DI-Module can be replaced		**by DIO-Module**	
Art.No.	**Description**	**Art.No.**	**Description**
56602	DI16 C 8xM12	56600	DIO16 C 8xM12
56603	DI16 E 8xM12	56601	DIO16 E 8xM12
56612	DI8 C 4xM12	56610	DIO8 C 4xM12
56613	DI8 E 4xM12	56611	DIO8 E 4xM12
56622	DI8 C 8xM8	56620	DIO8 C 8xM8
56623	DI8 E 8xM8	56621	DIO8 E 8xM8

4.3.3 Configuration Examples

Configuration examples with hardware manager Simatic Step 7.

4.3.3.1 Configuration of Compact Modules



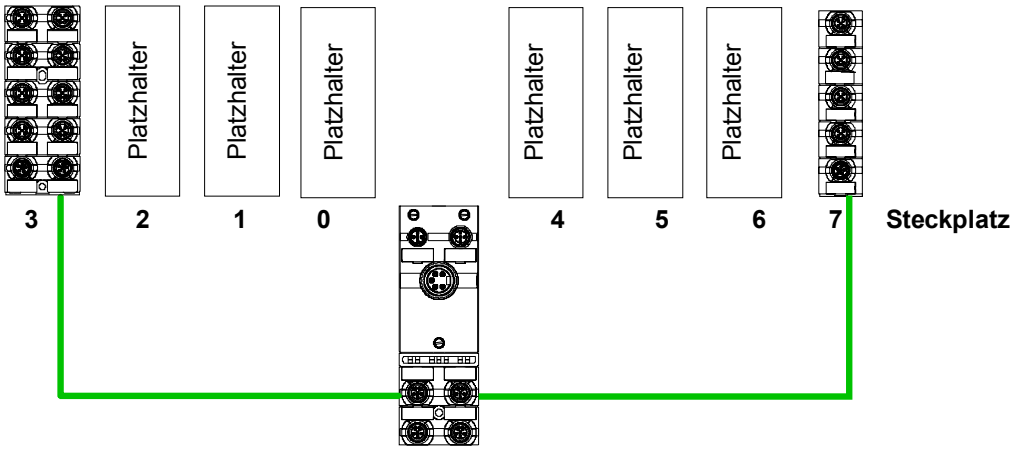
This configuration is made up of two compact modules connected to the sockets 0 and 1 of the internal system connection of the bus node.

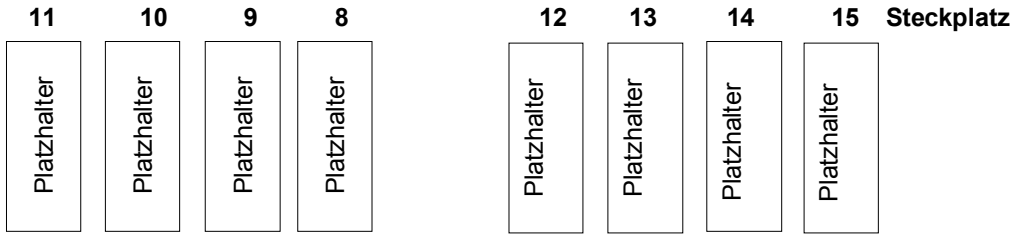
In this type of configuration, there is no direct relationship between the module position in the configuration table (socket) and the actual position on the bus (string/position in the string). Instead of connecting the modules to the sockets 0 and 1 of the bus node, they can also be connected to the sockets 1 and 3. The correct order is important and the configured modules have to correspond to the modules the bus node detects during system startup.

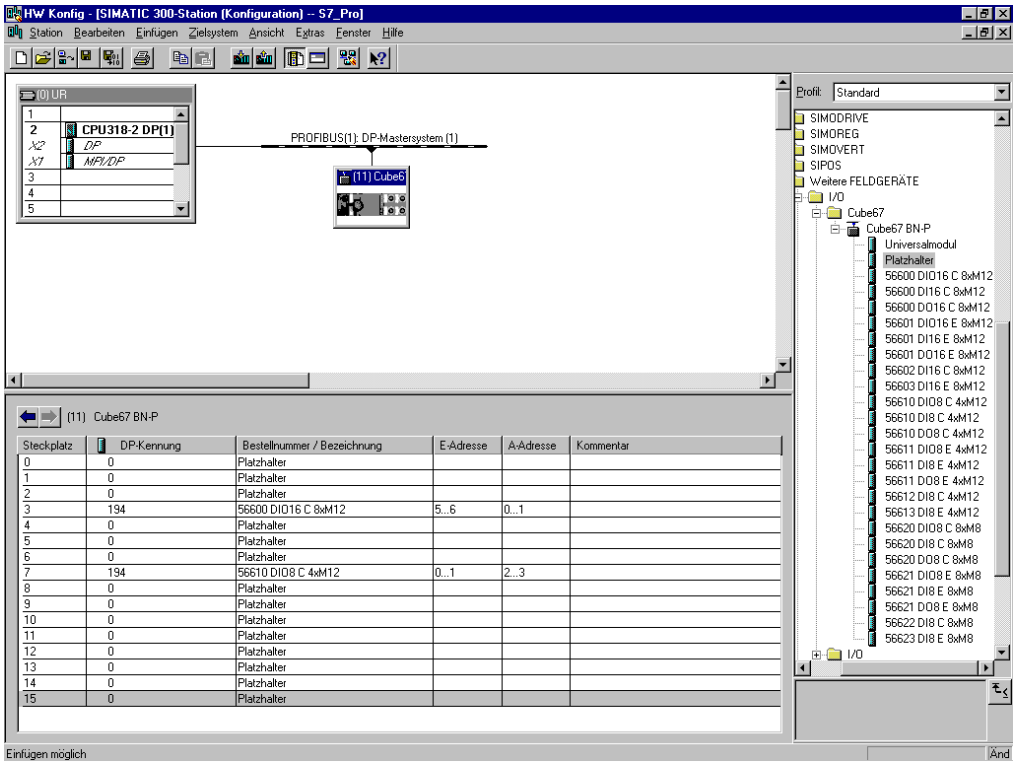
Note:

Placeholders can be integrated for a better arrangement of the configuration and a clear relationship between socket and actual position of the module. The configuration can be easily extended by replacing the placeholder, without affecting the already existing modules (these modules will keep their number for diagnostic purposes).

4.3.3.2 Configuration with Placeholders







This configuration is identical to the one shown in chapter 5.3.4.1. However, unused sockets of the Cube67 system are occupied by placeholders. A maximum of four modules per segment is allowed, therefore, the configuration table is structured as follows:

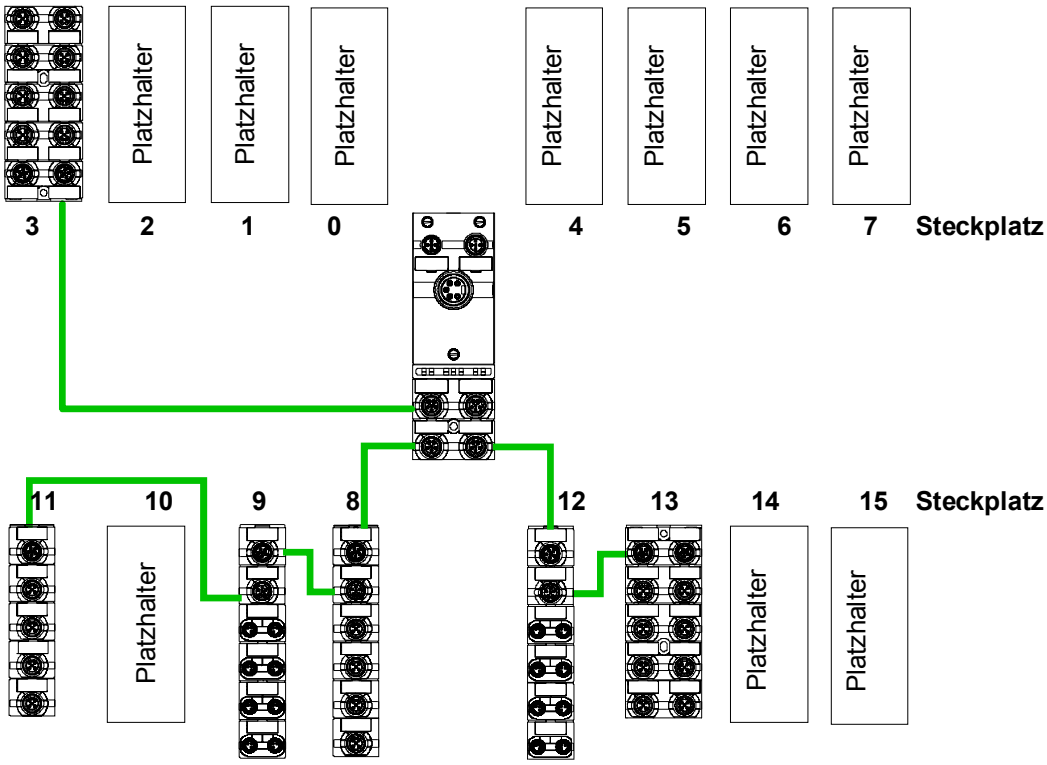
Socket	Segment no. of the Internal system connection	Module no. within a segment	Note
0	Segment 0	0	1st module in this segment
1		1	2nd module in this segment
2		2	3rd module in this segment
3		3	4th module in this segment
4	Segment 1	0	1st module in this segment
5		1	2nd module in this segment
6		2	3rd module in this segment
7		3	4th module in this segment
8	Segment 2	0	1st module in this segment
9		1	2nd module in this segment
10		2	3rd module in this segment
11		3	4th module in this segment
12	Segment 3	0	1st module in this segment
13		1	2nd module in this segment
14		2	3rd module in this segment
15		3	4th module in this segment

Examples:

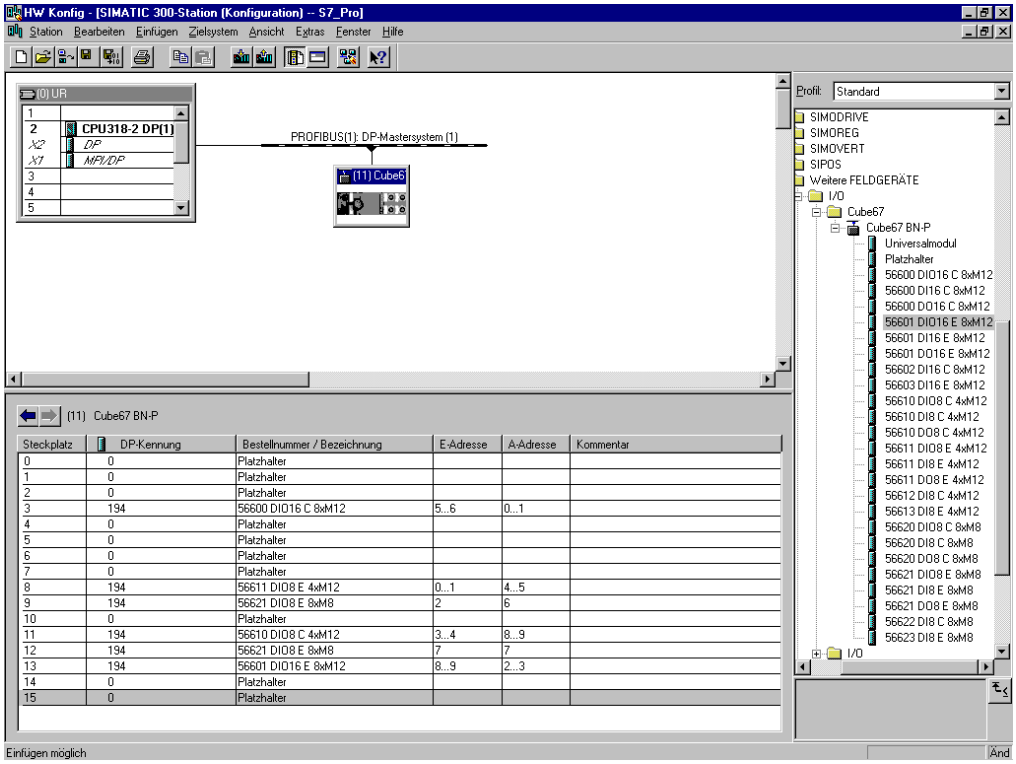
The third module in segment 2 is allocated to socket no. 10.

The module allocated to socket no. 7 is the 4th module in segment 1.

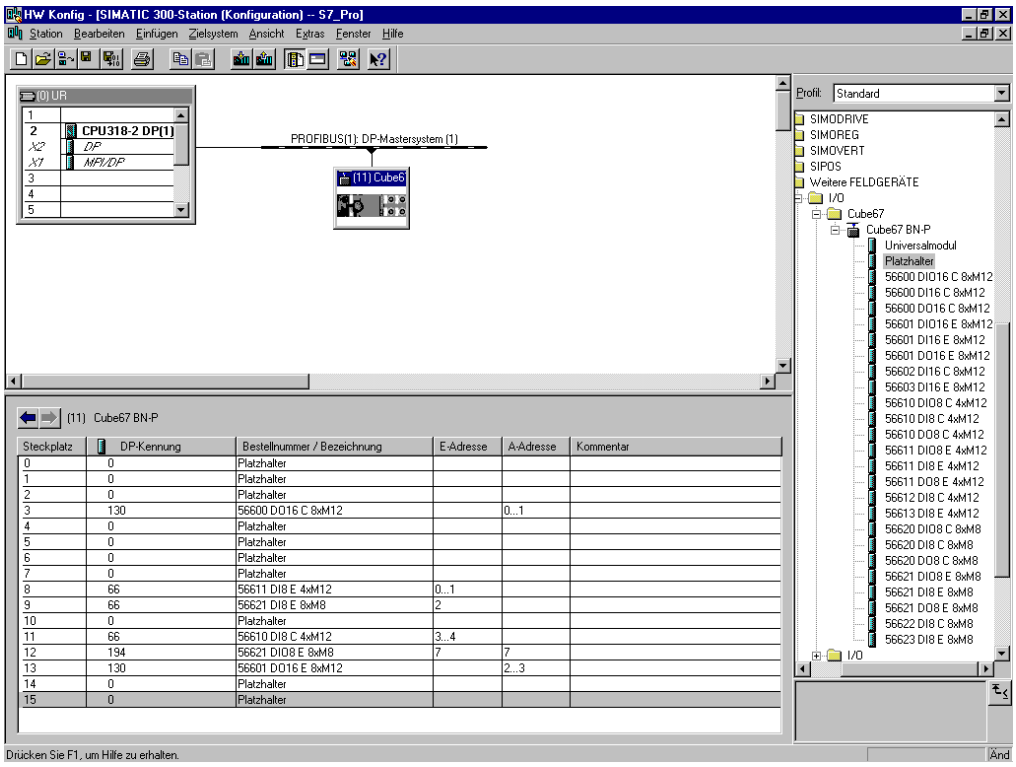
4.3.3.3 Configuration with Extension Modules



Extension modules allow connecting up to four I/O modules in one segment. Placeholders have been used in this configuration example.


HW Konfig - [SIMATIC 300-Station (Konfiguration) -- S7_Pro]
Station Bearbeiten Einfügen Zielsystem Ansicht Extras Fenster Hilfe
(0) UR
CPU318-2 DP(1)
DP
MPI/DP
PROFIBUS(1): DP-Mastersystem (1)
(11) Cube6
Profil: Standard
SIMODRIVE
SIMOREG
SIMOVERT
SIPOS
Weitere FELDGERÄTE
I/O
Cube67
Cube67 BN-P
Universalmodul
Platzhalter
56600 DIO16 C 8xM12
56600 DI16 C 8xM12
56600 DO16 C 8xM12
56601 DIO16 E 8xM12
56601 DI16 E 8xM12
56601 DO16 E 8xM12
56602 DI16 C 8xM12
56603 DI16 E 8xM12
56610 DIO8 C 4xM12
56610 DI8 C 4xM12
56610 DO8 C 4xM12
56611 DIO8 E 4xM12
56611 DI8 E 4xM12
56611 DO8 E 4xM12
56612 DI8 C 4xM12
56613 DI8 E 4xM12
56620 DIO8 C 8xM8
56620 DI8 C 8xM8
56620 DO8 C 8xM8
56621 DIO8 E 8xM8
56621 DI8 E 8xM8
56621 DO8 E 8xM8
56622 DI8 C 8xM8
56623 DI8 E 8xM8
(11) Cube67 BN-P
Steckplatz | DP-Kennung | Bestellnummer / Bezeichnung | E-Adresse | A-Adresse | Kommentar
0 | 0 | Platzhalter
1 | 0 | Platzhalter
2 | 0 | Platzhalter
3 | 194 | 56600 DIO16 C 8xM12 | 5...6 | 0...1
4 | 0 | Platzhalter
5 | 0 | Platzhalter
6 | 0 | Platzhalter
7 | 0 | Platzhalter
8 | 194 | 56611 DIO8 E 4xM12 | 0...1 | 4...5
9 | 194 | 56621 DIO8 E 8xM8 | 2 | 6
10 | 0 | Platzhalter
11 | 194 | 56610 DIO8 C 4xM12 | 3...4 | 8...9
12 | 194 | 56621 DIO8 E 8xM8 | 7 | 7
13 | 194 | 56601 DIO16 E 8xM12 | 8...9 | 2...3
14 | 0 | Platzhalter
15 | 0 | Platzhalter
Einfügen möglich

4.3.3.4 Configuration with Preconfigured Modules


HW Konfig - [SIMATIC 300-Station (Konfiguration) -- S7_Pro]
Station Bearbeiten Einfügen Zielsystem Ansicht Extras Fenster Hilfe
(0) UR
CPU318-2 DP(1)
DP
MPI/DP
PROFIBUS(1): DP-Mastersystem (1)
(11) Cube6
Profil: Standard
SIMODRIVE
SIMOREG
SIMOVERT
SIPOS
Weitere FELDGERÄTE
I/O
Cube67
Cube67 BN-P
Universalmodul
Platzhalter
56600 DIO16 C 8xM12
56600 DI16 C 8xM12
56600 DO16 C 8xM12
56601 DIO16 E 8xM12
56601 DI16 E 8xM12
56601 DO16 E 8xM12
56602 DI16 E 8xM12
56603 DI16 E 8xM12
56610 DIO8 C 4xM12
56610 DI8 C 4xM12
56610 DO8 C 4xM12
56611 DIO8 E 4xM12
56611 DI8 E 4xM12
56611 DO8 E 4xM12
56612 DI8 C 4xM12
56613 DI8 E 4xM12
56620 DIO8 C 8xM8
56620 DI8 C 8xM8
56620 DO8 C 8xM8
56621 DIO8 E 8xM8
56621 DI8 E 8xM8
56621 DO8 E 8xM8
56622 DI8 C 8xM8
56623 DI8 E 8xM8
(11) Cube67 BN-P
Steckplatz | DP-Kennung | Bestellnummer / Bezeichnung | E-Adresse | A-Adresse | Kommentar
0 | 0 | Platzhalter
1 | 0 | Platzhalter
2 | 0 | Platzhalter
3 | 130 | 56600 DO16 C 8xM12 | | 0...1
4 | 0 | Platzhalter
5 | 0 | Platzhalter
6 | 0 | Platzhalter
7 | 0 | Platzhalter
8 | 66 | 56611 DI8 E 4xM12 | 0...1
9 | 66 | 56621 DI8 E 8xM8 | 2
10 | 0 | Platzhalter
11 | 66 | 56610 DI8 C 4xM12 | 3...4
12 | 194 | 56621 DIO8 E 8xM8 | 7 | 7
13 | 130 | 56601 DO16 E 8xM12 | | 2...3
14 | 0 | Platzhalter
15 | 0 | Platzhalter
Drücken Sie F1, um Hilfe zu erhalten.

This structure corresponds to the configuration described in 0. The part numbers of the individual I/O modules are identical, however, preconfigured modules (DI or DO) have been used in this example. They differ from the freely configurable modules (DIO) by the description.

	Meaning	Note
DIO	Digital Input Output	The channels of this module are parameterized as inputs or outputs.
DO	Digital Output	The channels of this module are parameterized as outputs.
DI	Digital Input	The channels of this module are parameterized as inputs[2].

Advantages of pre-parameterized modules:

- Lesser settings required in the parameter dialogs of the configuration tool.
- Reduced memory requirements in the process image. The table below shows the memory requirements of the examples above with and without pre-parameterized I/O modules.

Example, chapter	Allocated bytes in the IDM[3]	Allocated bytes in the ODM[4]
0	6	5
0	10	10
Savings	40 %	50 %

[2] The different settings (NO, NC contact, diagnostic function) for inputs are still available. Default setting: Input with NO function.

[3] IDM = Input Data Map

[4] ODM = Output Data Map

4.3.3.5 Manual Assembly of a Configuration String

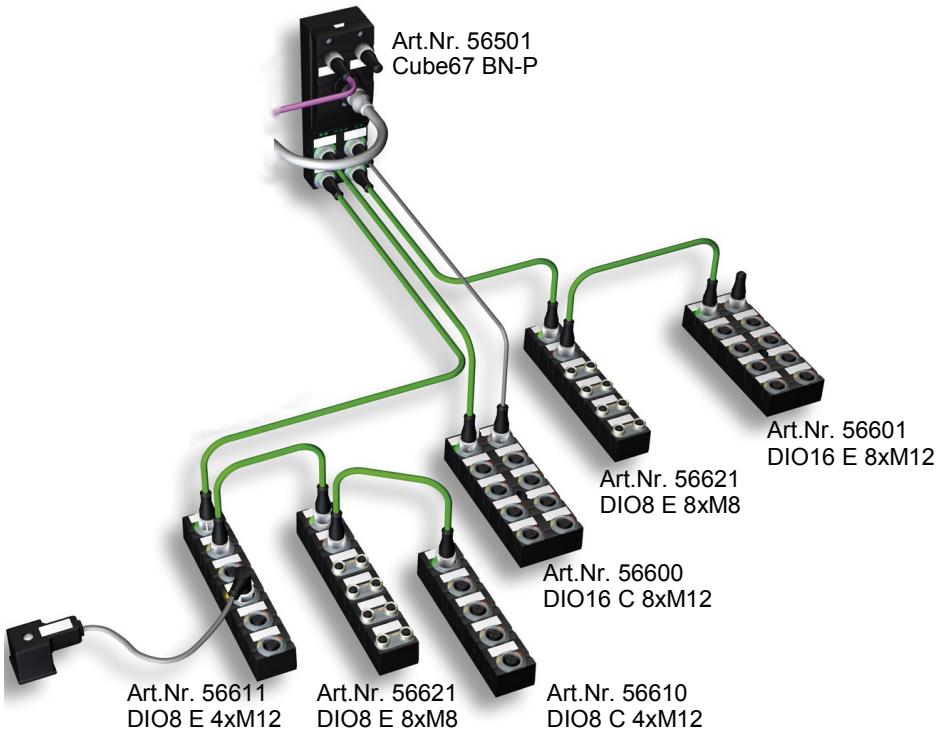


Fig. 3: Configuration Example

The bus node automatically addresses the modules in the order of connection. First. all modules connected to socket 0 of the internal system connection are counted, subsequently all modules connected to socket 1 of the internal system connection, and so on.

The configuration strings of the individual modules are shown in chapter "Modules".

The configuration string is transferred in the data field of the configuration telegram. Identification is entered in the order the modules are connected to the bus node.

1. Bus node

Art.No.	Module	Identification
56 501	Cube67 BN-P	01_{hex} 51_{hex}

2. I/O-Module

No./Slot	Art.No.	Module	Internal system connection	Identification
0	56600	DIO16 C 8xM12	Socket 0	$C2_{hex}$ 01_{hex} 01_{hex} DD_{hex} 18_{hex}
1	56611	DIO8 E 4xM12	Socket 2	$C2_{hex}$ 01_{hex} 01_{hex} DD_{hex} 23_{hex}
2	56621	DIO8 E 8xM8	Socket 2	$C2_{hex}$ 00_{hex} 00_{hex} DD_{hex} $2D_{hex}$
3	56610	DIO8 C 4xM12	Socket 2	$C2_{hex}$ 01_{hex} 01_{hex} DD_{hex} 22_{hex}

4	56621	DIO8 E 8xM8	Socket 3	$C2_{hex}$ 00_{hex} 00_{hex} DD_{hex} $2D_{hex}$
5	56601	DIO16 C 8xM12	Socket 3	$C2_{hex}$ 01_{hex} 01_{hex} DD_{hex} 19_{hex}

3. The configuration string looks like this (hexadecimal values):

C2,01,01, DD,18	C2,01,01, DD,23	C2,00,00, DD,2D	C2,01,01, DD,22	C2,00,00, DD,2D	C2,01,01, DD,19

The configuration software usually supports a visual configuration, so you don’t have to assemble the configuration string yourself.

4.3.3.6 Setup of Part Configurations

Setup of part configurations is supported from firmware version 3.00. As usual you enter the maximum configuration of the Cube system via the configuration tool. Subsequently, you can deactivate physically not existing modules by means of the extended “Machine Option Service” while the Cube system is booting.

Application

Manufacturers of machines with modular structure.

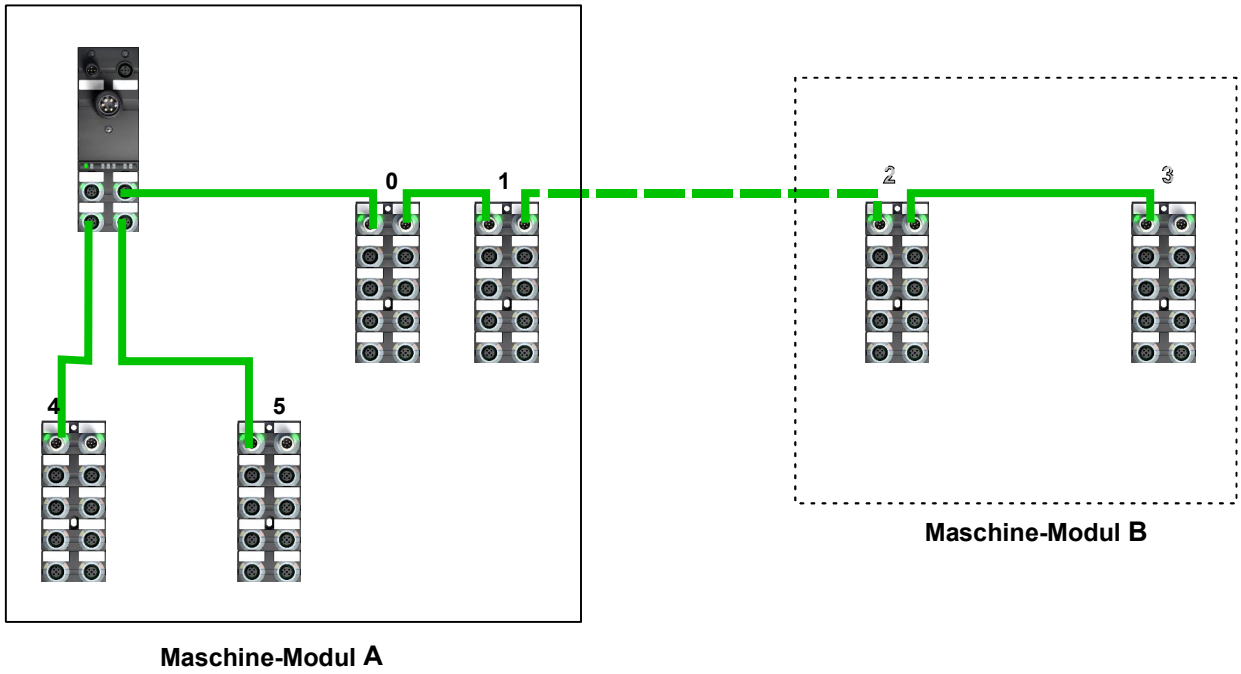


Fig. 4: Example Modular Machine

Example:

The manufacturer delivers a machine consisting of a base module A and an optional module B. The control and the bus node are integrated into module A. Module B only needs a few I/O points and therefore, it has no separate bus node. The installation or deinstallation of module B at a later date must be possible without modifying the configuration via the configuration tool.

The Machine Option Service is described in the chapter " Extended Functions".

4.4 Parameterization

With the parameterization you define the characteristics of the Cube67 system and the connected I/O modules. You decide:

- the function of an I/O channel (input or output)
- if and what kind of diagnostic is reported or disabled
- etc.

When using a graphic configuration tool, parameterization will be easy thanks to the information contained in the GSD file. For operating instructions please refer to the docmentation of the corresponding tool.

If such a tool is not available, the parameter string can be assembled with the following information. For the coding of the parameter bytes of the bus node and the I/O modules please refer to chapter "**Fehler! Verweisquelle konnte nicht gefunden werden.**".

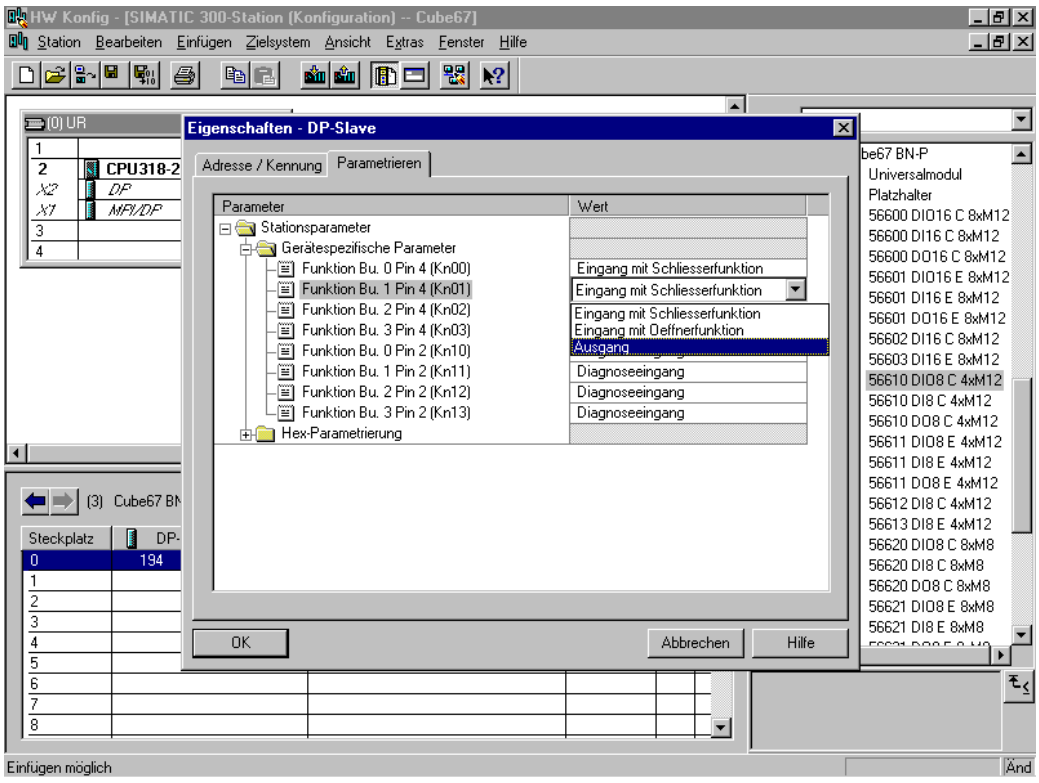


Fig. 5: Hardware Configurator in a Simatic S7 Environment

Two already pre-parameterized versions each are provided in the GSD file for the freely parameterizable modules.

These pre-parameterized modules can be used if you need only inputs or only outputs.

See also chapter " Configuration with Preconfigured Modules".

4.4.1 Parameter Message

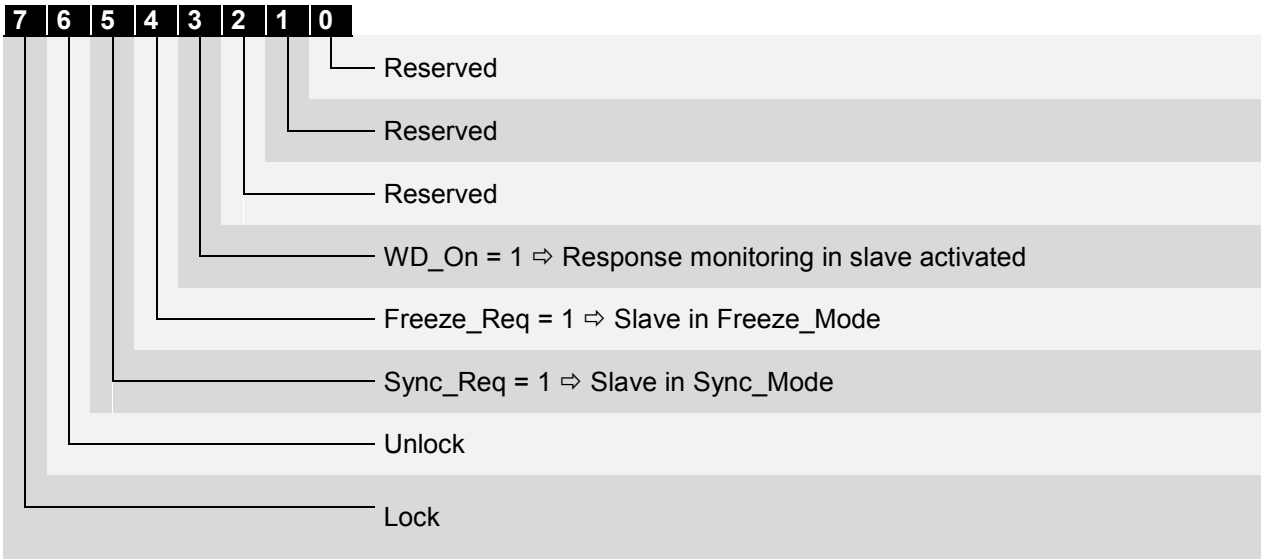
The master sends a parameter message to the slave. The first 7 bytes are defined by ProfiBus standard IEC 61158. They are followed by the user parameters. Number and composition of the user parameters depend on the structure of the Cube67 system.

A plaintext message is stored in the GSD file for any possible parameterization.

4.4.1.1 Structure of the Standard Specific Parameters (Bytes 0 to 6)

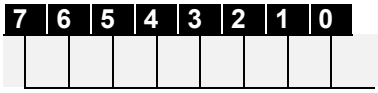
Byte	Bit n								Selection
	7	6	5	4	3	2	1	0	
0	Lock Req	Unlock Req	Sync Req	Free Req	WD On	res	res	res	Station Status
1									WD_Fact_1
2									WD_Fact_2
3									MinTSDR
4									Ident_Number_High
5									Ident_Number_Low
6									Group_Ident

Byte 0


7 6 5 4 3 2 1 0
Reserved
Reserved
Reserved
WD_On = 1 ⇨ Response monitoring in slave activated
Freeze_Req = 1 ⇨ Slave in Freeze_Mode
Sync_Req = 1 ⇨ Slave in Sync_Mode
Unlock
Lock

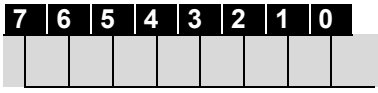
Lock	Unlock	Meaning
0	0	minTSDR and slave specific parameters may be overwritten
0	1	DP-Slave is enabled for other masters
1	0	DP-Slave is disabled for other masters; all parameters are accepted
1	1	DP-Slave is enabled for other masters

Byte 1



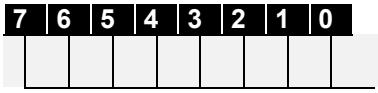
WD_Fact_1

Byte 2



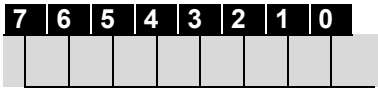
WD_Fact_2[5]

Byte 3



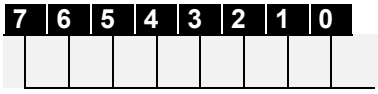
TSDR[6]

Byte 4



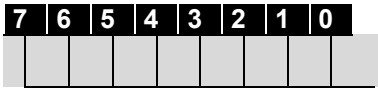
Id. number Highbyte (hier : 06_{hex})

Byte 5



Id. number Lowbyte (hier : $4D_{hex}$)

Byte 6



Group_Ident

[5] TWD (s) = 10ms . WD_FACT_2. Time to expiration of response monitoring in the DP slave.

[6] Time in Tbit until DP slave is allowed to reply at the earliest. The standard requires a value of at least 11. This value must, in any case, be less than max_{TSDR}

4.4.1.2 User Parameters

The standard parameters are followed by a number of user parameter bytes that depends on the structure of the Cube67 system. The user parameters first include the parameters for the bus node, and then parameter bytes for the different modules. The sequence corresponds to the order in which the modules are connected to the bus node. For more details refer to chapter " Configuration Information".

Example of parameterization of bus node and a Cube67 DIO16 C 8xM12:

Requirement:

If the actuator supply drops below 12 V, the bus node should not generate a diagnostic message (“no actuator supply”). This is useful when undervoltage of the actuator is monitored, while no diagnostic report should be generated if the actuator supply is cut off (e.g. because a guard door was opened).

The I/O module must be parametrized as output at Pin 4 and as NO input at Pin 2 (not negated input).

The user parameter string will be as follows (hexadecimal values).

Bus node				I/O Module Cube67 DIO16 C 8xM12							
00	00	00	80	AA	AA	00	00	00	00	00	00
Reserved	Reserved	Reserved	Global settings	Function channels 00 to 03	Function channels 04 to 07	Function channels 10 to 13	Function channels 14 to 17	Reserved	Reserved	Reserved	Reserved

4.4.2 Preconfigured Moduels

Two already pre-parameterized versions each are provided in the GSD file for the freely parameterizable modules.

These pre-parameterized modules can be used, if you need only inputs or only outputs.

Advantages of pre-parameterized modules:

- Addresses are allocated either in the IDM[7] or in the ODM[8] of the PLC.
- Quick parameterisation during the configuration of I/O modules.

[7] Input Data Map
[8] Output Data Map

4.5 Step by Step: Setup

4.5.1 Mechanical Structure

4.5.1.1 Mounting the Cap of the Bus Node

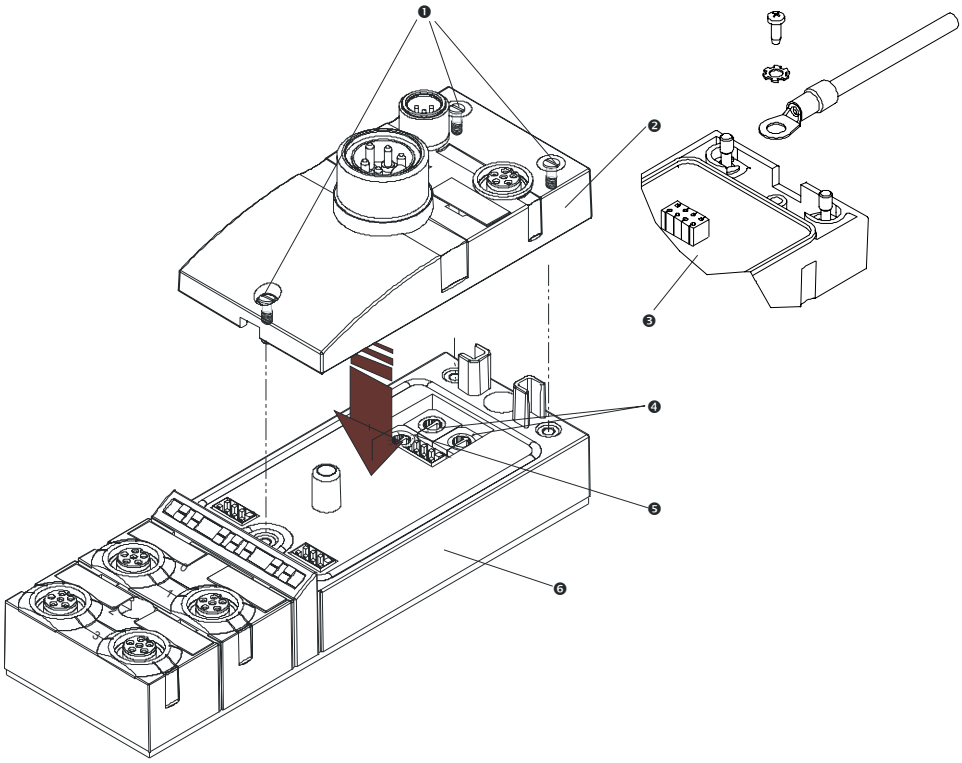


Fig. 6: Mounting the Cap of the Bus Node

1. Fixing screws
2. Cap
3. FE connection (View cap from below)
4. ProfiBus address switches
5. Base module

Step by step:
① Set the Profibus address using the two BCD switches 4. in the base module 5.

② Connect the FE cable on the bottom side 3. of the cap 2.

③ Mount the cap 2. onto the base module. Take care not to tilt the cap.

④ Three captive screws 1. are integrated into the cap. Tighten them down.

For the correct torque please see the installation manual.

4.5.1.2 Interconnection of System Components

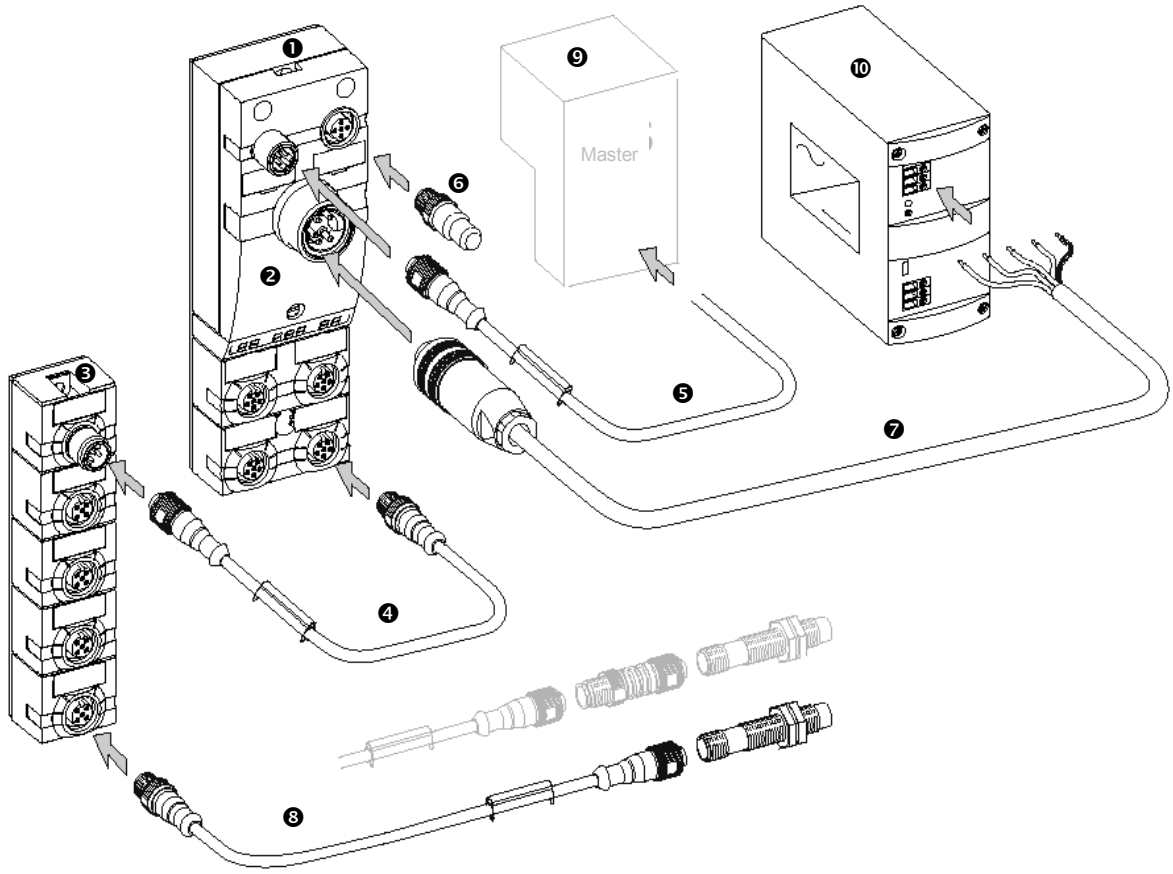


Fig. 7: Interconnection of System Components

1. Bus node, base module
2. Bus node, cap
3. Cube67 DIO8 C 4xM12
4. Internal system connection
5. Incoming ProfiBus cable
6. ProfiBus terminating resistor
7. Power supply cable
8. M12 cable to sensor or actuator
9. Control
10. Power supply unit

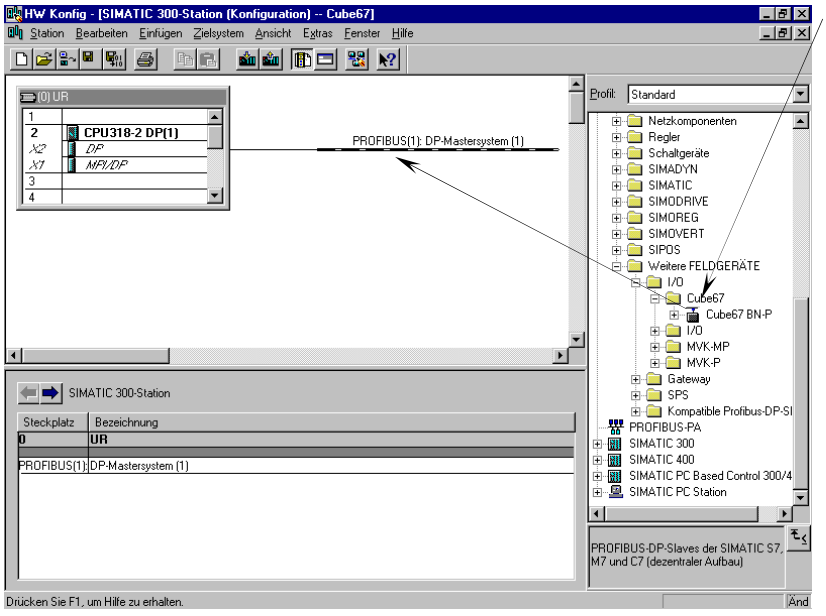
Step by Step:

- Connect the module 5. via the green system cable 4. to the bus node 1..
- Connect M12 cables 8.to the sensors or actuators with the module 3..
- Connect incoming ProfiBus cable 5. to the bus-in connection of the cap 2.
- Connect the outgoing ProfiBus cable with the next ProfiBus station; if the bus node is the last ProfiBus station, connect a terminating resistor 6.
- Connect the power supply 10. via the 7/8“ connector.

4.5.2 Configuration with S7 Hardware Manager

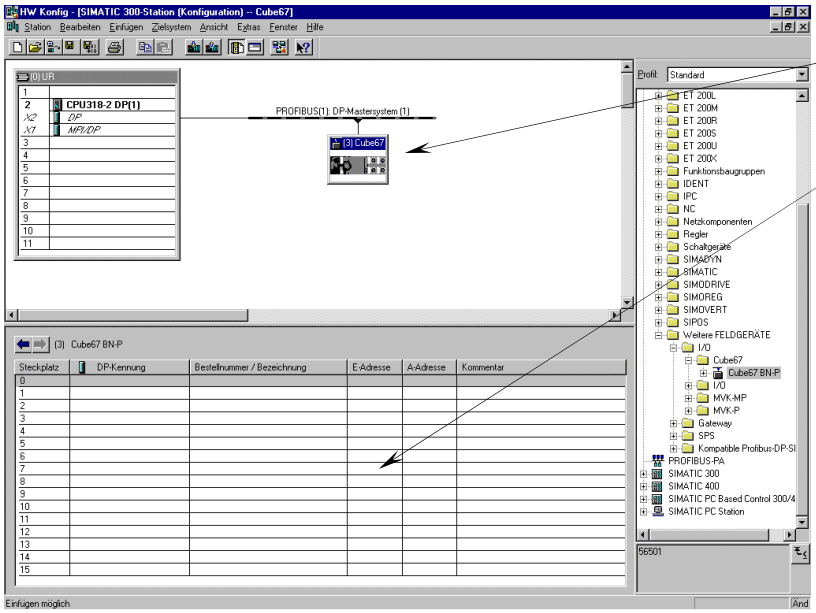
This chapter explains the HW configuration as an example (hardware setup software of the Siemens Simatic S7 Manager) to show how a Cube67 System is configured and parameterized.

Providing more detailed information, particularly information on diagnostics processing, would go beyond the scope of this manual. For relevant details please refer to the documentation of the DP master or the controller (PLC).



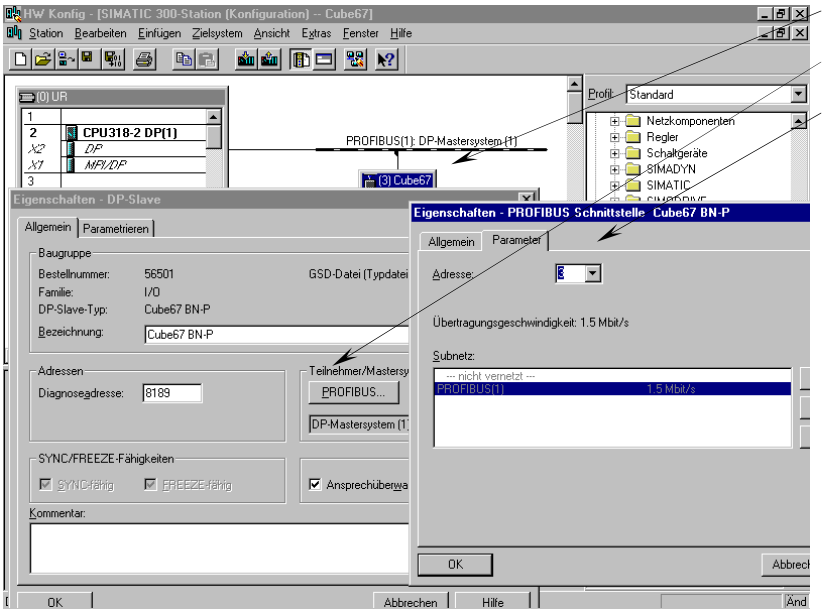
You will find Cube67 in the hardware catalog of the Simatic Manager under "Additional Field Devices" and "I/O".

Mark "Cube20 BN-P" and drag the entry to the ProfiBus string while keeping the left mouse button depressed.



Click on the Cube67 bus node previously connected to the ProfiBus to call up a table in the lower half of the screen in which the individual modules connected to the bus node can be entered.

Assigning the ProfiBus Address



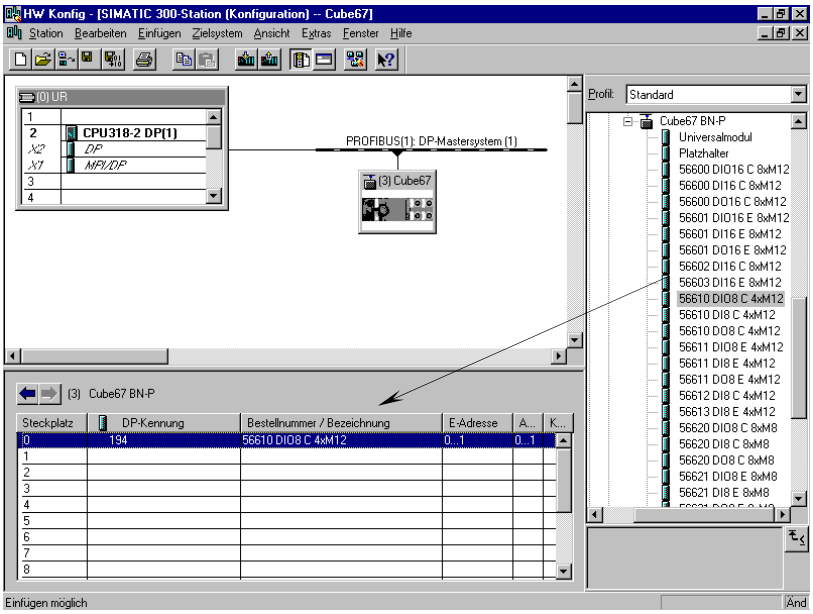
① Double click on the bus node

② Click on “ProfiBus…”

③ Set the address

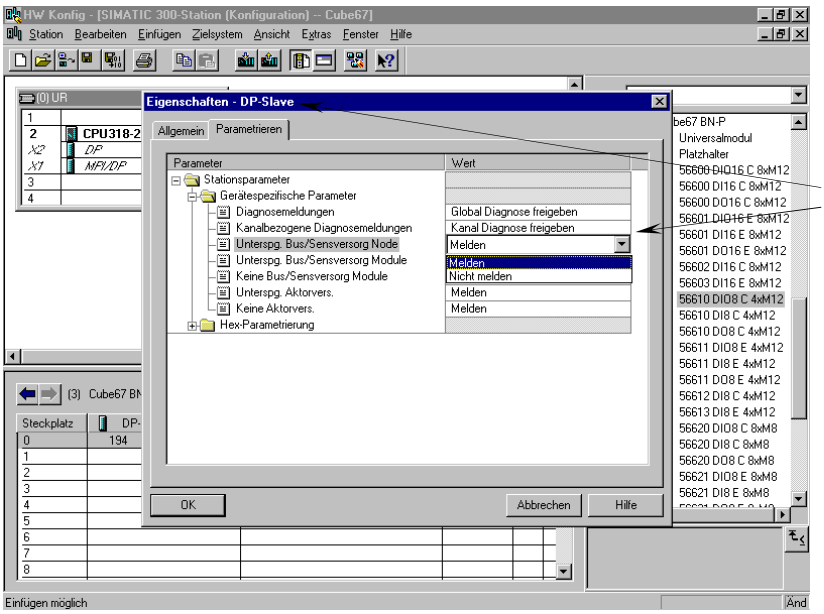
④ Close the window

Inserting an I/O-Module



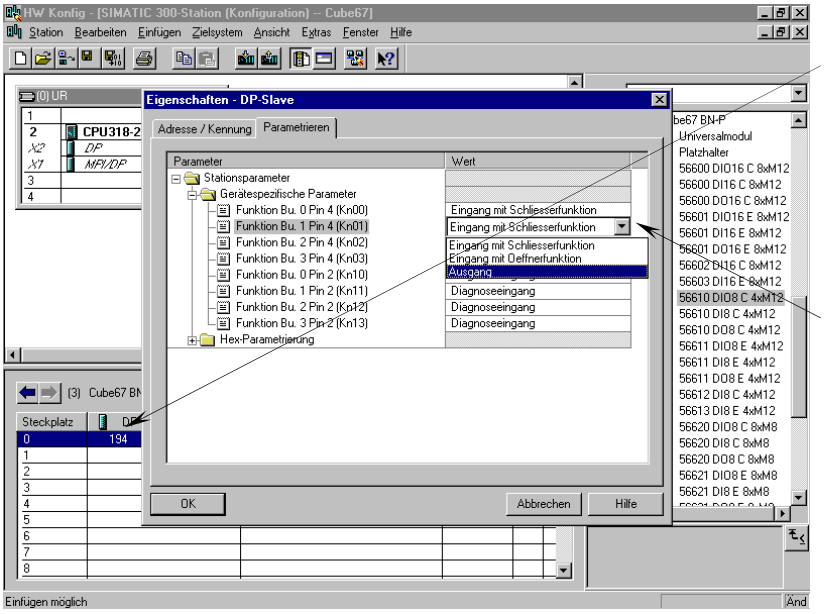
Join the module with the designation “Cube67 DIO8 C 4xM12” on the first line of the table by dragging the module with the left mouse button pressed.

Global Settings



Double click on the bus node to perform global settings under the “Parameterization” tab.

Module-related Settings



To open the Properties dialog of the module, double-click the left mouse button on the modules specified in the table.

Module-related settings, (e.g. parameterization of channels as input or output) can be performed via this dialog.

5. Diagnostics

5.1 Behavior in Case of Interrupted Communication

If the internal system connection is interrupted (communication line or sensor supply from the bus node to the different Cube67 I/O modules) the whole system is switched into fault status. Input data can no longer be read. The internal status of the system connection is indicated via the bus node diagnostics.

Profibus line interrupted	
Bus node:	
BusRun LED	Green flashing
US LED	Green
ProfiBus diagnostic	The user is not accessible
I/O-Module:	
US LED	Green
Outputs	The outputs are switched off.

Internal system connection interrupted	
Bus node	
BusRun LED	Green flashing
US LED	Green flashing in case of communication error in this segment.
ProfiBus diagnostic	In extended diagnostic, the error message “communication error” is activated for all modules that are no longer accessible.
I/O module with sensor supply	
US LED	Green flashing
Outputs	The outputs are switched off.
I/O module without sensor supply	
US LED	The module electronics is not supplied. All LEDs are off.
Outputs	The outputs are switched off.

The display of the US – and UA – LEDs depends on the power supply status. In case of undervoltage the LED is red. In case of undervoltage and communication error, the corresponding US – LED flashes red.

From version 3.10 of the bus node the input data of all modules that are not accessible will be set to zero. The input data of all accessible modules will be updated.

CAUTION!

Cube67 modules are no safety-related devices according to the relevant standards. The Off-status of the outputs must not be used to meet safety-related requirements of the application!

5.2 Cube20 LED displays

5.2.1 Significance of the Status of the "Power" LED

The "Power" LED indicates the status of the Cube20 system voltage and the internal communication.

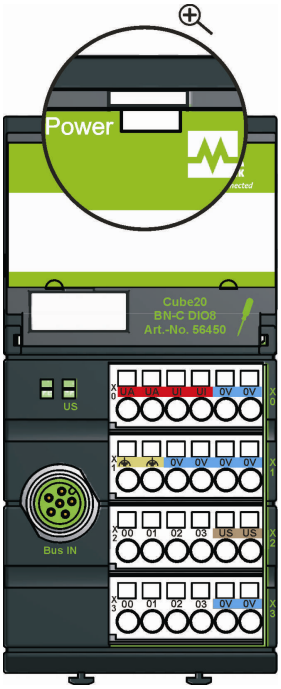
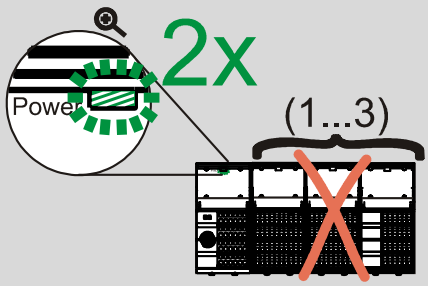


Fig. 8: Power LED on Cube20 Modules

5.2.1.1 Behavior of the Power LED of the Cube20 BN-C DIO8 Art.No.: 56 450

Color		Significance for Power LED	Remedy
	green	System voltage (>12V) available	
	Green flashing	System connection in the Cube20 system is interrupted, no. of flashing pulses corresponds to the position of the faulty expansion module (1…3), with several modules the closest one	Exchange the affected module and activate power reset of the Cube67 system (restart bus node)
		Example: 	
	OFF	No system power (<12V)	Increase voltage

Tab. 2: Behavior of the Power LED of the Cube20 BN-C DIO8 Art.No.: 56 450

5.2.1.2 Behavior of the Power Led of Cube20 I/O Modules

Color		Significance for Power LED	Remedy
	fast flashing (approx. 20Hz)	System power available and module exchanging data	
	OFF	No system power via the Cube20 system connection	Wait for initialization of the Cube20 system (can take some seconds) Check internal system connection (profile cable) & activate power reset of the Cube20 system (restart bus node)

Tab. 3: Behavior of the Power Led of Cube20 I/O Modules

5.2.2 Signification of the "US" LED

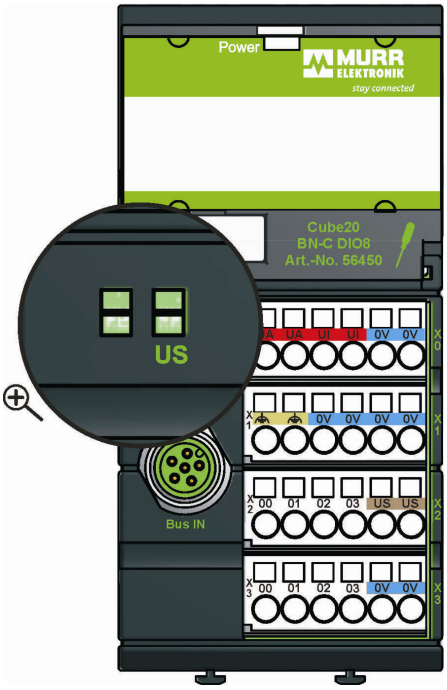


Fig. 9: "US" LED on Cube20 Modules

LED designation	LED display[9]	Behavior	Status
US		Lit	Data exchange.
US		Flashing	No data transfer[10]
US		Off	No communication[11]

Tab. 4: Status of System Communication

[9] The display color indicates the voltage status.
[10] The communication in at least one segment is interrupted.
[11] No sensor supply in the module.

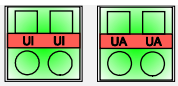
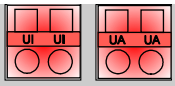
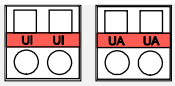
5.2.3 Displays for Supply Voltage at the Terminals of All Modules

5.2.3.1 Module Supply

There is no LED at terminal "UB". The state of system voltage is signalized by the Power LED.

See chapter: Significance of the states of the "Power" LED

- Indicators with „UI“ show the state of the supply voltage for the internal system
- Indicators with „UA“ show the state of the supply voltage for actuators.

LED indicator UI / UA	Behavior	Status
	Green	Supply voltage OK (>= 18V)
	Red	Under voltage (< 18V)
	Off	Voltage <= 12.5V

Tab. 5: LED Module Supply

5.2.3.2 Periphery Supply

- Indicators with „US“ show the state of the supply voltage for sensors
- Indicators with „UA0…UA3" show the state of the supply voltage for actuators.

LED indicator US / UA	Behavior	Status
	Off	Supply voltage OK
	Red	Overload or short circuit of the sensor or actuator supply

Tab. 6: ED Periphery Supply

Two terminals each have one common "US" LED.

5.2.4 Signal Logic State and LED Behavior

5.2.4.1 Digital modules

A separate status indicator is assigned for each input and output. It is labeled with "00…03" or "00…07". Furthermore, the labeling corresponds to channel number and bit position. It is situated under the corresponding terminal and allows easy mapping to the state of the peripheral components, sensors and actuators.

Connection of signal logic state and LED behavior at the input

LED display		Logic value	Voltage at input	Signal
	Off	0	0 V	Input with N/O contact
	Yellow	1	24 V	

Tab. 7: LED at Input of Digital Modules

Connection of signal logic state and LED behavior at the output

LED display		Logic value	Voltage at output	Signal
	Off	0	0 V	Output
	Yellow	1	24 V	
	Red	1	0 V	Output in case of short-circuit

Tab. 8: LED at Output of Digital Modules

5.2.4.2 Analog Modules

A separate status indicator is assigned for each input and output. The corresponding LED is situated under the respective terminal.

Cube20 AI4 U/I Art.-No.: 56 200 / 56 201

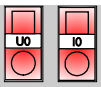
The terminals are labeled with the channel numbers „S0…S3".

LED display		Status	Possible diagnosis
	Off	OK	-
	Red	Diagnosis	Wire break Overflow Underflow

Tab. 9: LEDs of the Channels of the Analog Modules Cube20 AI4 U/I Art. No.: 56 200 / 56 201

Cube20 AO4 U/I Art.-No.: 56 220 / 56 221

The terminals are labeled with the channel numbers "U0…U3" and "I0…I3".

LED display		Status	Possible diagnosis
	Off	OK	-
	Red	Diagnosis	Wire break Actuator short circuit

Tab. 10: LEDs der Kanäle an den Analogmodulen Cube20 AO4 U/I Art.-No.: 56 220 / 56 221

Cube20 AI4 RTD Art.-No.: 56 230

The terminals are labeled with the channel numbers „+R0…+R3".

LED display		Status	Possible diagnosis
	Off	OK	-
	Red	Diagnosis	Wire break Overflow Underflow

Tab. 11: LED of the channels of the analog module Cube20 AI4 RTD Art.-No.: 56 230

Cube20 AI4 RTD Art.-No.: 56 240

The terminals are labeled with the channel numbers „TH0+…TH3+".

LED display		Status	Possible diagnosis
	Off	OK	-
	Red	Diagnosis	Wire break Overflow Underflow Wire break cold junction compensation (KTY)

Tab. 12: LEDs of the channels of the analog module Cube20 AI4 TH Art.-No.: 56 240

5.3 Cube67 LED Displays

5.3.1 General Information

The Cube67 system is capable of detecting and reporting numerous errors. Errors are reported (diagnosis) via:

- LED displays
- ProfiBus diagnosis diagnostic message See chapter " Diagnosis via ProfiBus".

5.3.2 Bus node

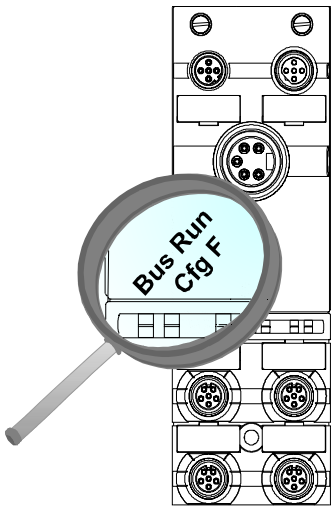


Fig. 10: LED displays on the bus node

Color		Signification for Bus Run LED	Remedy
	green	ProfiBus - DP data exchange	-
	green flashing	No DP data exchange	cf. Chapter 0 Troubleshooting in a ProfiBus network
	Off	ProfiBus firmware not yet initialized	Initializing the bus node may take some seconds

Tab. 13: Status displays of the BusRun LED on the bus node

Color		Signification for Cfg F LED	Remedy
	Off	-	-
	Red	Profibus DP configuration error or parameterization error.	cf. Chapter 0 Troubleshooting in a Profibus network

Tab. 14: Status displays of the CfgF[12] LED on the bus node

[12] CfgF = configuration fault

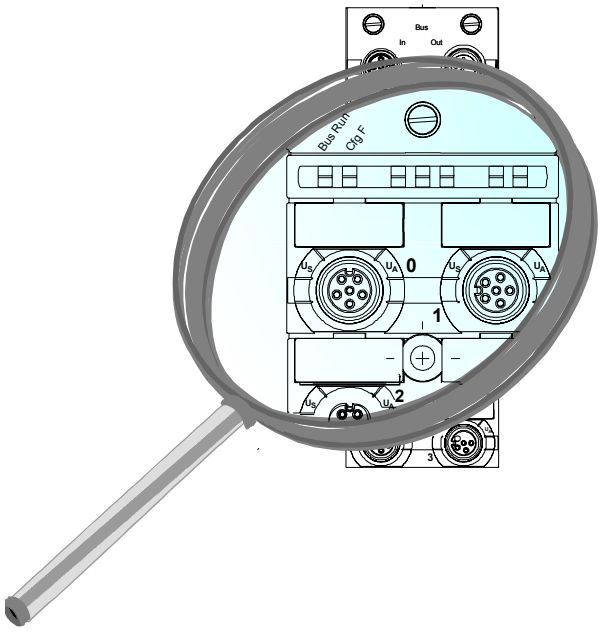
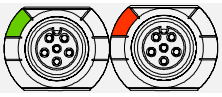
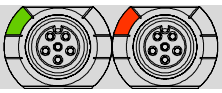
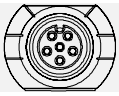
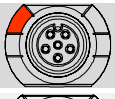
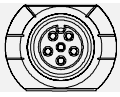


Fig. 11: Location of the US- and UA displays on the bus node

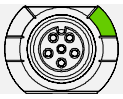
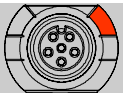
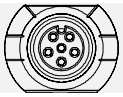
LED designation	LED display[13]	Behavior	Status
US		Lit	Data exchange."
US		Flashing	No data exchange
US		Off	No communication

Tab. 15: Status of System Communication on the Bus Node

LED designation	LED display	Behavior	Status
US		Green	ok (> 18 V)
US		Red	Undervoltage or short-circuit sensor supply
US		Off	No supply or sensor supply < 12.5 V

Tab. 16: Status of sensor and system supply on the bus node

[13] The display color indicates the voltage status.

LED designation	LED display	Behavior	Status
UA		Green	ok (> 18 V)
UA		Red	Undervoltage or short-circuit actuator supply
UA		Off	No supply or actuator supply 12.5 V

Tab. 17: Status of actuator supply on the bus node

5.3.2.1 Bus Node Response to Faulty Supply Voltage

5.3.2.1.1. Short-circuit of Sensor Supply of Internal System Connection

A short-circuit at the socket or in the cable of the system connection is detected. The sensor supply, and hence the module supply for this segment, is switched off. The system goes over into communication error. After the short-circuit has been rectified, the internal system connection can be restarted via a voltage reset of the sensor supply. In case of inadequate power supply unit, it will be switched off before the short-circuit detection by the bus node and will initiate a reset of the bus node. The US LED on the bus node is lit red for this segment.

5.3.2.1.2. Short-circuit of Actuator Supply of Internal System Connection

A short-circuit at the socket or in the cable of the system connection is detected. The actuator supply for this segment is switched off. After the short-circuit has been rectified, it can be cleared via a voltage reset of the actuator supply. The UA LED on the bus node is lit red for this segment.

5.3.2.1.3. Undervoltage of Sensor Supply of Internal System Connection

Undervoltage is detected below approx. 17.0 V. The US displays of the segments affected are red. If the voltage drops below approx. 12.5 V, the bus node goes into reset. The bus node reconnects to the ProfiBus as soon as the sensor voltage rises above approx. 13.0 V.

5.3.3 Displays of Digital I/O Modules

5.3.3.1 LED Displays of Digital I/O Modules

5.3.3.1.1. Bus IN – LED display

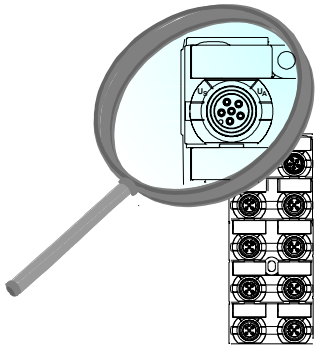
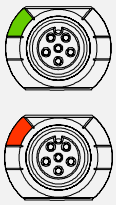
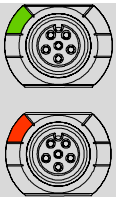
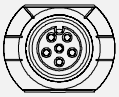


Fig. 12: Location of the US- and UA displays, Art. No. 56 600

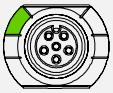
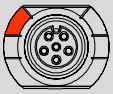
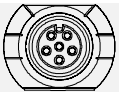
LED designation	LED display[14]	Behavior	Status
US		Lit	Data exchange
US		Flashing	No data exchange[15]
US		Off	No communication[16]

Tab. 18: Status of System Communication

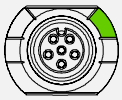
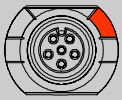
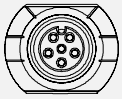
[14] The display color indicates the voltage status.

[15] Communication interrupted in at least one segment.

[16] The module has no sensor supply.

LED designation	LED display	Behavior	Status
US		Green	ok (> 18 V)
US		Red	Undervoltage
US		Off	No supply (< 12 V)

Tab. 19: Status of the sensor and system supply (BusIn display)

LED designation	LED display	Behavior	Status
UA		Green	ok (> 18 V)
UA		Red	Undervoltage
UA		Off	No supply (< 12 V)

Tab. 20: Status of the internal actuator supply (BusIn display)

5.3.3.1.2. External Power – LED display (only Art. No. 56 600, 56 640)

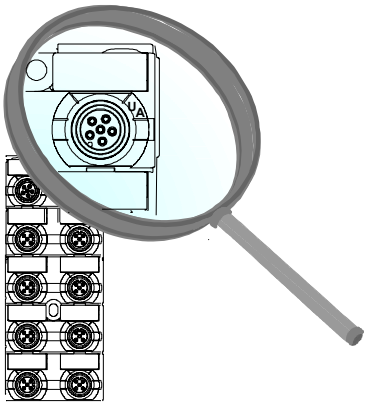
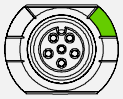
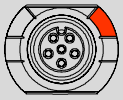
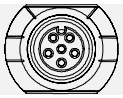


Fig. 13: Location of the UA displays, Art. No. 56 600

LED designation	LED display	Behavior	Status
UA		Green	ok (> 18 V)
UA		Red	Undervoltage
UA		Off	No supply (< 12 V)

Tab. 21: Status of the External Power display (only Art. No. 56 600, 56 640)

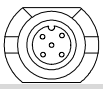
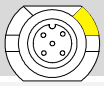
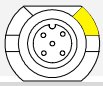
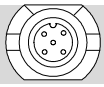
5.3.3.1.3. M12 Sockets – LED Diagnostic Display

LED display[17]	Voltage channels 00…07	Voltage channels 10…17	Diagnostic channels 00…07	Diagnostic channels 10…17
	0 V	0 V	-	External fault
	0 V	0 V	-	Sensor short-circuit at Pin 1
	0 V	0 V	-	Actuator cut-off
	0 V	24 V	-	Actuator warning
	-	0 V	-	-
	0 V	0 V	Sensor short-circuit at Pin 1	-
	0 V	0 V	Actuator cut-off	-
	24 V	0 V	Actuator warning	-

Tab. 22: M12 Sockets – LED Diagnostic Display

5.3.3.2 Relationship between Signal Logic Representation and LED Response

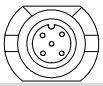
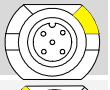
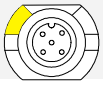
Every input and output has a separate status display. It is labeled with "00…07" or "10…17". It is located next to the corresponding M12 socket and allows easy mapping to the status of the peripheral components such as sensors and actuators.

	Voltage at input		Logical value	LED display[18]	
	00…07	10…17			
Input with N/O contact	0 V	0 V	0		Off
	0 V	24 V	1		Yellow
	24 V	0 V	1		Yellow
Input with N/C contact	0 V	0 V	1		Off
	0 V	24 V	0		Yellow
	24 V	0 V	0		Yellow
Diagnosis input	-	0 V	1		Red
	-	24 V	0		Off

[17] All diagnosis displays are red.

[18] If a channel-related diagnosis is available, the LED assigned to this channel is continuously lit red.

Tab. 23: Relationship between Signal Logic Representation and LED Response - Input

	Logical value	Voltage at output		LED display	
		00…01	10…11		
Output	0	0 V	0 V		Off
	1	0 V	24 V		Yellow
	1	24 V	0 V		Yellow

Tab. 24: Relationship between Signal Logic Representation and LED Response - Output

5.3.4 Displays of Counter Modules

5.3.4.1 LED Displays of Counter Modules

5.3.4.1.1. Bus IN – LED display

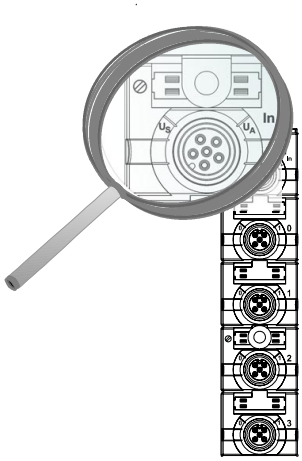
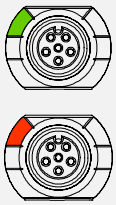
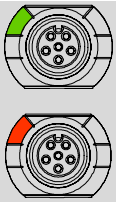
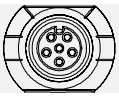
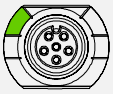
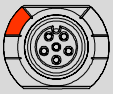
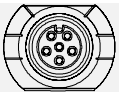


Fig. 14: Location of the US- and UA displays, Art. No. 56 750

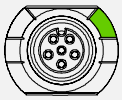
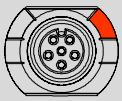
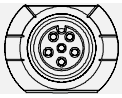
LED designation	LED display[19]	Behavior	Status
US		Lit	Data exchange
US		Flashing	No data exchange[20]
US		Off	No communication[21]

Tab. 25: Status of the system communication

[19] The display color indicates the voltage status.
[20] Communication interrupted in at least one segment.
[21] The module has no sensor supply.

LED designation	LED display	Behavior	Status
US		Green	Ok (> 18 V)
US		Red	Undervoltage
US		Off	No supply (< 12 V)

Tab. 26: Status of the sensor and system supply (BusIn display)

LED designation	LED display	Behavior	Status
UA		Green	Ok (> 18 V)
UA		Red	Undervoltage
UA		Off	No supply (< 12 V)

Tab. 27: Status of the internal actuator supply (BusIn display)

5.3.4.1.2. M12 Sockets – LED Diagnostic Display

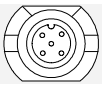
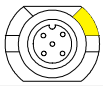
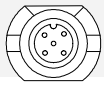
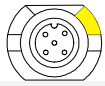
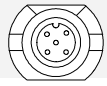
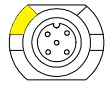
LED display[22]	Voltage channels 00…03	Voltage channels 00…03	Diagnosis channels 00…03	Diagnosis channels 00…03
	0 V	0 V	-	External fault
	0 V	0 V	-	Sensor short-circuit at Pin 1
	0 V	0 V	-	Actuator cut-off
	-	0 V	-	-
	0 V	0 V	Sensor short-circuit at Pin 1	-
	0 V	0 V	Actuator cut-off	-

Tab. 28: M12 sockets – LED Diagnostic display

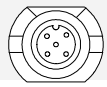
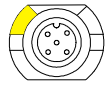
[22] All diagnostic displays are red.

5.3.4.2 Relationship between Signal Logic Representation and LED Response

Every input and output has a separate status display. It is labeled with "00…03". It is located next to the corresponding M12 socket and allows easy mapping to the status of the peripheral components such as sensors and actuators.

		Voltage at input	Logical value	Signal	LED display	
Inputs	GATE	0 V	0			Off
		24 V	1			Yellow
	UP / DOWN	0 V	0	Counting Up		Off
		24 V	1	Counting Down		Yellow
	Counter	0 V	0	No counting impulses		Off
		24 V	1	Counting impulses		Yellow

Tab. 29: Relationship between Signal Logic Representation and LED Response - Input

	Logical value	Voltage at output	LED display	
Output	0	0 V		Off
	1	24 V		Yellow

Tab. 30: Relationship between Signal Logic Representation and LED Response - Output

5.3.5 Displays of RS485 – Modules

5.3.5.1 LED Displays of RS485 - Modules

5.3.5.1.1. Bus IN – LED display

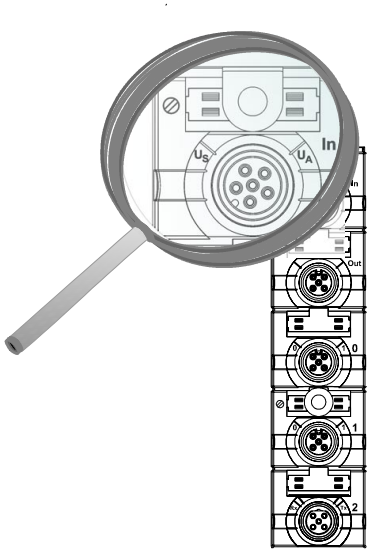
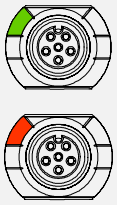
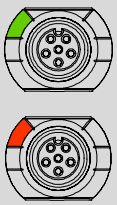
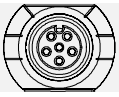
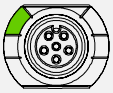
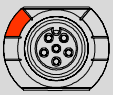
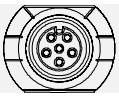


Fig. 15: Location of the US- and UA displays, Art. No. 56760

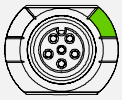
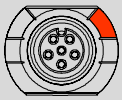
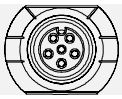
LED designation	LED display[23]	Behavior	Status
US		Lit	Data exchange
US		Flashing	No data exchange[24]
US		Off	No communication[25]

Tab. 31: Status of the system communication

[23] The display color indicates the voltage status.
[24] Communication interrupted in least one segment.
[25] The module has no sensor supply.

LED designation	LED display	Behavior	Status
US		Green	Ok (> 18 V)
US		Red	Undervoltage
US		Off	No supply (< 12 V)

Tab. 32: Status of the sensor and system supply (BusIn display)

LED designation	LED display	Behavior	Status
UA		Green	Ok (> 18 V)
UA		Red	Undervoltage
UA		Off	No supply (< 12 V)

Tab. 33: Status of the internal actuator supply (BusIn display)

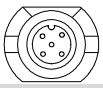
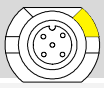
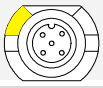
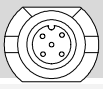
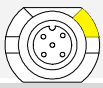
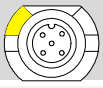
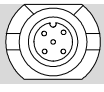
5.3.5.1.2. M12 Sockets: 0, 1 – LED Diagnostic Display

LED display[26]	Voltage channels 00…01	Voltage channels 10…11	Diagnosis channels 00…01	Diagnosis channels 10…11
	0 V	0 V	-	External fault
	0 V	0 V	-	Sensor short-circuit at Pin 1
	0 V	0 V	-	Actuator cut-off
	0 V	24 V	-	Actuator warning
	-	0 V	-	-
	0 V	0 V	Sensor short-circuit at Pin 1	-
	0 V	0 V	Actuator cut-off	-
	24 V	0 V	Actuator warning	-

Tab. 34: M12 sockets – LED diagnostic display

5.3.5.2 Relationship between Signal Logic Representation and LED Response

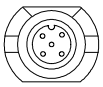
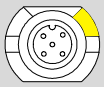
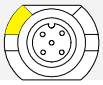
Every input and output has a separate status display. It is labeled with "00…01". It is located next to the corresponding M12 socket and allows easy mapping to the status of the peripheral components such as sensors and actuators.

	Voltage at input		Logical value	LED display[27]	
	00…01	10…11			
Input with N/O contact	0 V	0 V	0		Off
	0 V	24 V	1		Yellow
	24 V	0 V	1		Yellow
Input with N/C contact	0 V	0 V	1		Off
	0 V	24 V	0		Yellow
	24 V	0 V	0		Yellow
Diagnostic input	-	0 V	1		Red
	-	24 V	0		Off

Tab. 35: Relationship between Signal Logic Representation and LED Response input

[26] All diagnostic displays are red.

[27] If a channel-related diagnosis is available, the LED assigned to this channel is continuously lit red.

	Logical value	Voltage at output		LED display	
		00…01	10…11		
Output	0	0 V	0 V		Off
	1	0 V	24 V		Yellow
	1	24 V	0 V		Yellow

Tab. 36: Relationship between Signal Logic Representation and LED Response output

LED designation	LED display	Behavior	Status
RX		Off	No data exchange
		Flashing	Data exchange
TX		Off	No data exchange
		Flashing	Data exchange

Tab. 37: Relationship between Signal Logic Representation and LED Response output

5.3.6 Displays of Logic – Modules

5.3.6.1 LED displays of Logic Modules

5.3.6.1.1. Bus IN – LED display

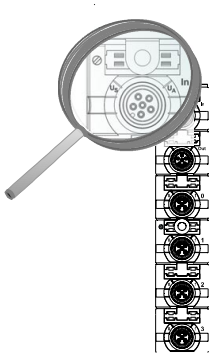
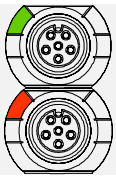
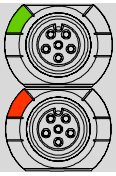
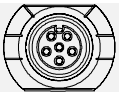
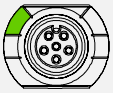
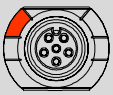
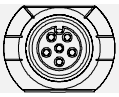


Fig. 16: Location of US- and UA displays, Art.-No. 56771

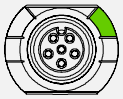
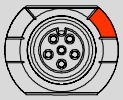
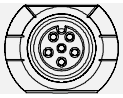
LED designation	LED display[28]	Behavior	Status
US		Lit	Data exchange
US		Flashing	No data exchange[29]
US		Off	No communication[30]

Tab. 38: Status of the system communication

[28] The display color indicates the voltage status.
[29] Communication interrupted in least one segment.
[30] The module has no sensor supply.

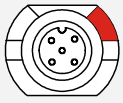
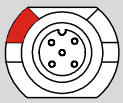
LED designation	LED display	Behavior	Status
US		Green	Ok (> 18 V)
US		Red	Undervoltage
US		Off	No supply (< 12 V)

Tab. 39: Status of the sensor and system supply (BusIn display)

LED designation	LED display	Behavior	Status
UA		Green	Ok (> 18 V)
UA		Red	Undervoltage
UA		Off	No supply (< 12 V)

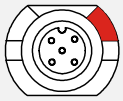
Tab. 40: Status of the internal actuator supply (BusIn display)

5.3.6.1.2. M12 sockets – LED Diagnostic Display

LED display[31]	Voltage channel 03	Voltage channel 13	Diagnosis channel 03	Diagnosis channel 13
	0 V	0 V	-	External fault
	0 V	0 V	-	Sensor short-circuit at Pin 1
	0 V	0 V	-	Actuator cut-off
	-	0 V	-	-
	0 V	0 V	Sensor short-circuit at Pin 1	-
	0 V	0 V	Actuator cut-off	-

Tab. 41: Status of the M12 sockets – LED Diagnostic Display

[31] All diagnostic displays are red.

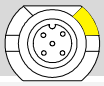
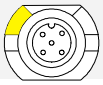
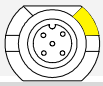
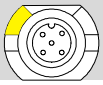
LED display[32]	Voltage channels 00…02	Voltage channels 10…12	Diagnosis channels 00…02	Diagnosis channels 10…12
	0 V	0 V	-	External fault
	0 V	0 V	-	Sensor short-circuit at Pin 1
	-	0 V	-	-
	0 V	0 V	Sensor short-circuit at Pin 1	-
				-

Tab. 42: M12 sockets – LED Diagnostic display

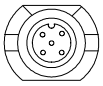
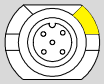
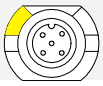
[32] All diagnostic displays are red.

5.3.6.2 Relationship between Signal Logic Representation and LED Response

Every input and output has a separate status display. It is labeled with "00…03". It is located next to the corresponding M12 socket and allows easy mapping to the status of the peripheral components such as sensors and actuators.

	Voltage at input		Logical value	LED display[33]	
	00…02	10…12			
Input with N/O contact	0 V	0 V	0		Off
	0 V	24 V	1		Yellow
	24 V	0 V	1		Yellow
Input with N/C contact	0 V	0 V	1		Off
	0 V	24 V	0		Yellow
	24 V	0 V	0		Yellow

Tab. 43: Relationship between Signal Logic Representation and LED Response- Input

	Logical value	Voltage at output		LED display	
		03	13		
Output	0	0 V	0 V		Off
	1	0 V	24 V		Yellow
	1	24 V	0 V		Yellow

Tab. 44: Relationship between Signal Logic Representation and LED Response- Output

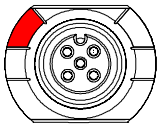
[33] If a channel-related diagnosis is available, the LED assigend to this channel is continuously lit red.

5.3.7 Displays of the analog I/O – Modules

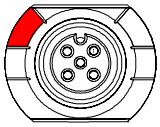
5.3.7.1 Bus IN – LED Display

The function of the Bus IN – LED display is identical to digital modules. See chapter 5.3.6.1.1 Bus In – LED Display.

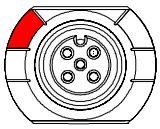
5.3.7.2 M12 Sockets – LED Diagnostic Display

LED display		Measured vaiable at input	Channel-related diagnosis
	Red	-	Sensor short-circuit
		> parameterized measuring range	Measuring range overshoot
		< parameterized measuring range	Measuring range undershoot[34]
		< 2 mA	Wire break (only Art.No. 56730)

Tab. 45: M12 Sockets – LED Diagnostic Display AI4 (U) / (I)

LED display		Set-point at output	Channel-related diagnosis
	Red	-	Sensor short-circuit
		0 V	Short-circuit (only Art.-No. 56 710)
		> 2 mA	Wire break (only Art.-No. 56 720)

Tab. 46: M12 sockets – LED Diagnostic Display AO4 (U) / (I)

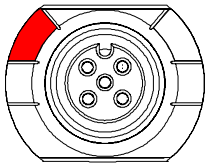
LED display		Measured vaiable at input	Channel-related diagnosis
	Red	-	Sensor short-circuit
		> parameterized measuring range	Measuring range overshoot
		< parameterized measuring range	Measuring range undershoot
		> 2 mA	Wire break
		Parameter failure	Threshold overlap for range over-rshoot and undershoot

Tab. 47: M12 sockets – LED Diagnostic Display AI4 (U) / (I) Art.-Nr. 56731

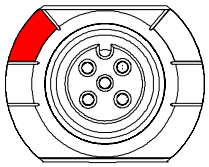
Note:

The channel has no display when the channel diagnostic parameter is suppressed for a particular error.

[34] Operation mode -10V…+10 V, or 4 mA…20mA only.

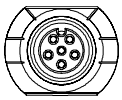
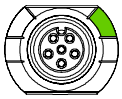
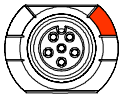
LED display		Set-point at input	Channel-related diagnosis
	red	> 1800°C	Wire break
		Higher than parameterized measuring range	Measuring range overshoot
		Lower than parameterized measuring range	Measuring range undershoot
		0x7FFF	Wire break

Tab. 48: M12 Buchsen – LED Diagnose Anzeige AI4 RTD

LED display		Set-point at input	Channel-related diagnosis
	red	> 2000°C keine KTY	Wire break
		Higher than parameterized measuring range	Measuring range overshoot
		Lower than parameterized measuring range	Measuring range undershoot
		0x7FFF	Wire break

Tab. 49: M12 Socket – LED Diagnostic Display AI4 TH

5.3.8 Displays on Power Distributor

LED display		Voltage at output	Status
	Off	0 V	No supply voltage connected
	Green	Present	Power supply connected
	Red	0 V	Short-circuit at output

Tab. 50: 6-pole M12 sockets – LED – display

Undervoltage detection is not supported by the power distributor. Undervoltage diagnosis is performed in the module supplied by the voltage drawn from the power distributor.

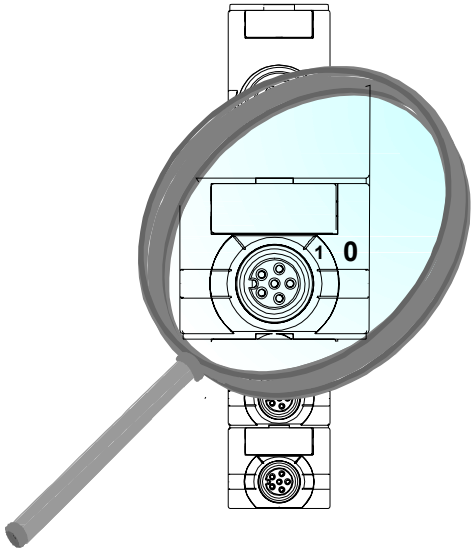


Fig. 17: Location of the power distributor displays

5.3.9 Displays on the Valve DO16/DO8 and Cable DIO8

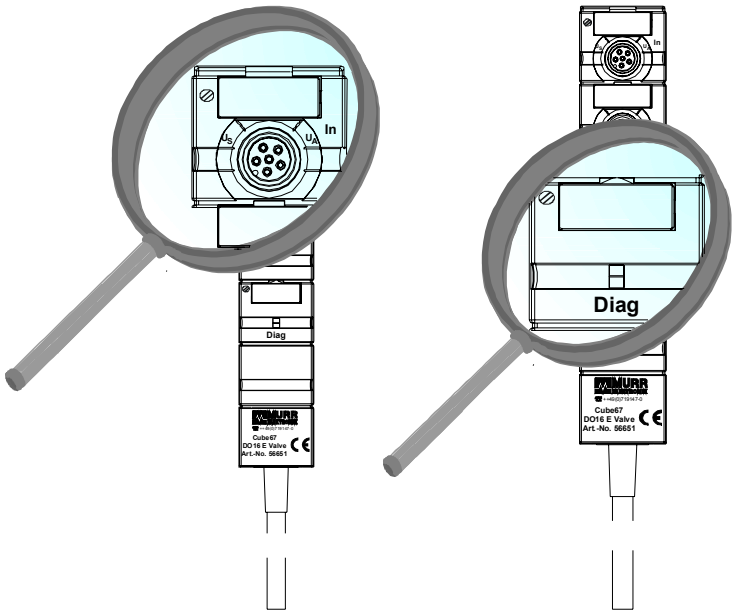


Fig. 18: location on the Valve DO16/DO8 and on Cable DIO8

5.3.9.1 Bus IN – LED display

The function of the Bus IN – LED display is identical to digital modules. See chapter 5.3.3.1.1 Bus In – LED Display.

5.3.9.2 DIAG – LED display

Tab. 51: DIAG – LED display

LED display		Diagnosis
	Off	No diagnosis
	Red	Short-circuit at least at one output
	Red	Wire break, “sens” wire (valve only)
	Red	Sensor short-circuit (cable only)

5.3.10 Displays Valve DO16 C K3

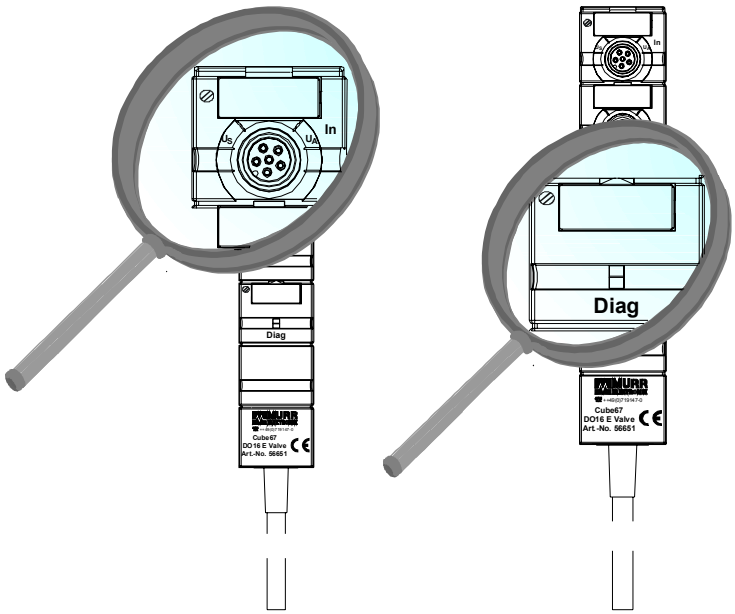
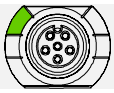
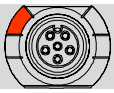
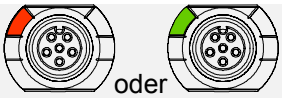
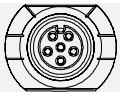
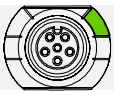
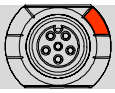
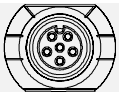


Fig. 19: Status of system supply on the module

LED designation	LED display	Behavior	Status
US		Green	ok (> 18 V) and data exchange
US		Red	Undervoltage sensor supply
US		Flashing: Red oder Green	No data exchange
US		Off	No communication

5.3.10.1.1. UA – LED display

Tab. 52: Status of the actuator supply on the module

LED designation	LED display	Behavior	Status
UA		Green	all four actuator supplies > 18 V
UA		Red	Undervoltage one or several actuator supplies
UA		Off	No supply or one or several actuators < 12.5 V

Tab. 53: DIAG – LED display

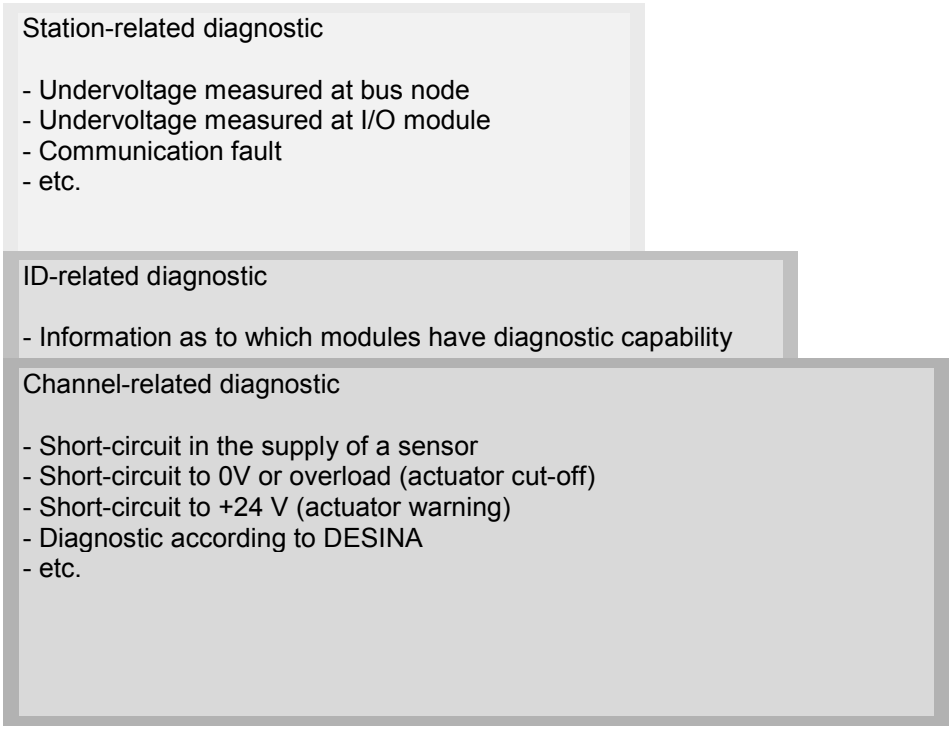
LED display		Diagnosis
	Off	No diagnosis
	Red	Short-circuit at least at one output
	Red	Actuator warning at least at one outptu

5.4 Diagnosis via ProfiBus

Diagnosis status modification of the Cube67 system is reported to the DP master. The DP master then requests the diagnostic information, which is supplied in the form of the diagnostic message described below.

Some DP masters accept in standard configuration only diagnostic messages with a maximum length of 32 bytes. If possible, this value should be set to the maximum ProfiBus DP supported length of 244 bytes. Otherwise, the max. length must be limited by blinding channel-related diagnostic messages (bus node parameters, see chapter 4.4). In this case, channel-related diagnostic is only reported in the form of a collective bit in the station diagnostic.

The diagnostic model of ProfiBus DP distinguishes between three layers of diagnostic information.


Station-related diagnostic
- Undervoltage measured at bus node
- Undervoltage measured at I/O module
- Communication fault
- etc.
ID-related diagnostic
- Information as to which modules have diagnostic capability
Channel-related diagnostic
- Short-circuit in the supply of a sensor
- Short-circuit to 0V or overload (actuator cut-off)
- Short-circuit to +24 V (actuator warning)
- Diagnostic according to DESINA
- etc.

Diagnostic messages can be masked out selectively via the bus node parameterization.

Example:

In an application, the actuator supply voltage is to be monitored for undervoltage, but no diagnosis is to be generated when the actuator voltage is switched off, e.g. in an emergency stop situation.

Solution:

The parameter “No actuator supply” of the bus node is set to “Do not report”.

Result:

No diagnosis is generated if the actuator supply voltage is less than 12 V. If the voltage is between 12 V and 18 V, the diagnosis “Undervoltage actuator supply” will be reported.

5.4.1 Diagnosis Overflow

The Cube67 bus node can process up to 16 channel diagnostic messages and report them to the DP master. In presence of more than 16 channel diagnostic messages, the Diag.ext_overflow bit (standard diagnostic information, byte 2) is set in the DP diagnostic message.

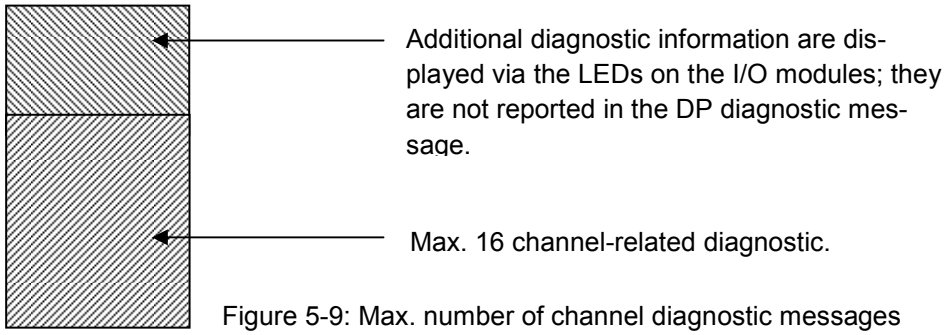

Additional diagnostic information are displayed via the LEDs on the I/O modules; they are not reported in the DP diagnostic message.
Max. 16 channel-related diagnostic.

Figure 5-9: Max. number of channel diagnostic messages

Station diagnostic includes one module-related diagnostic byte for each I/O module.

Bytes 10 to 25 Module-related diagnosis (1 byte for each module)

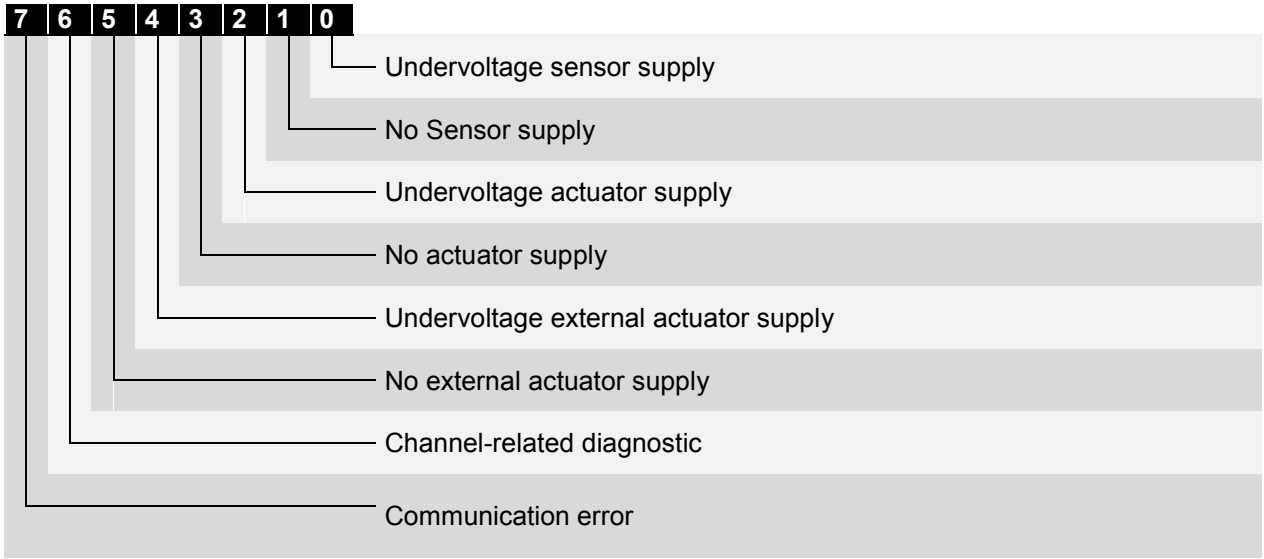


Fig. 20: Bytes 10 to 25 Module-related diagnosis

The collective bit “Channel-related diagnostic” is only set if there is at least on channel-related diagnostic for the I/O module and if it belongs to the 32 channel-related diagnostic messages that can be reported.

This is also the case if the channel-related diagnosis has been masked out via the bus node parameterization. The Diag.ext_overflow bit is set in both cases.

5.4.2 Structure of a Diagnostic Message

Diagnostic information comprises standard diagnostic information (6 bytes) and manufacturer-specific diagnostic information.

5.4.2.1 Byte 0 bis 5 : Standard Diagnostic Information

Byte 0

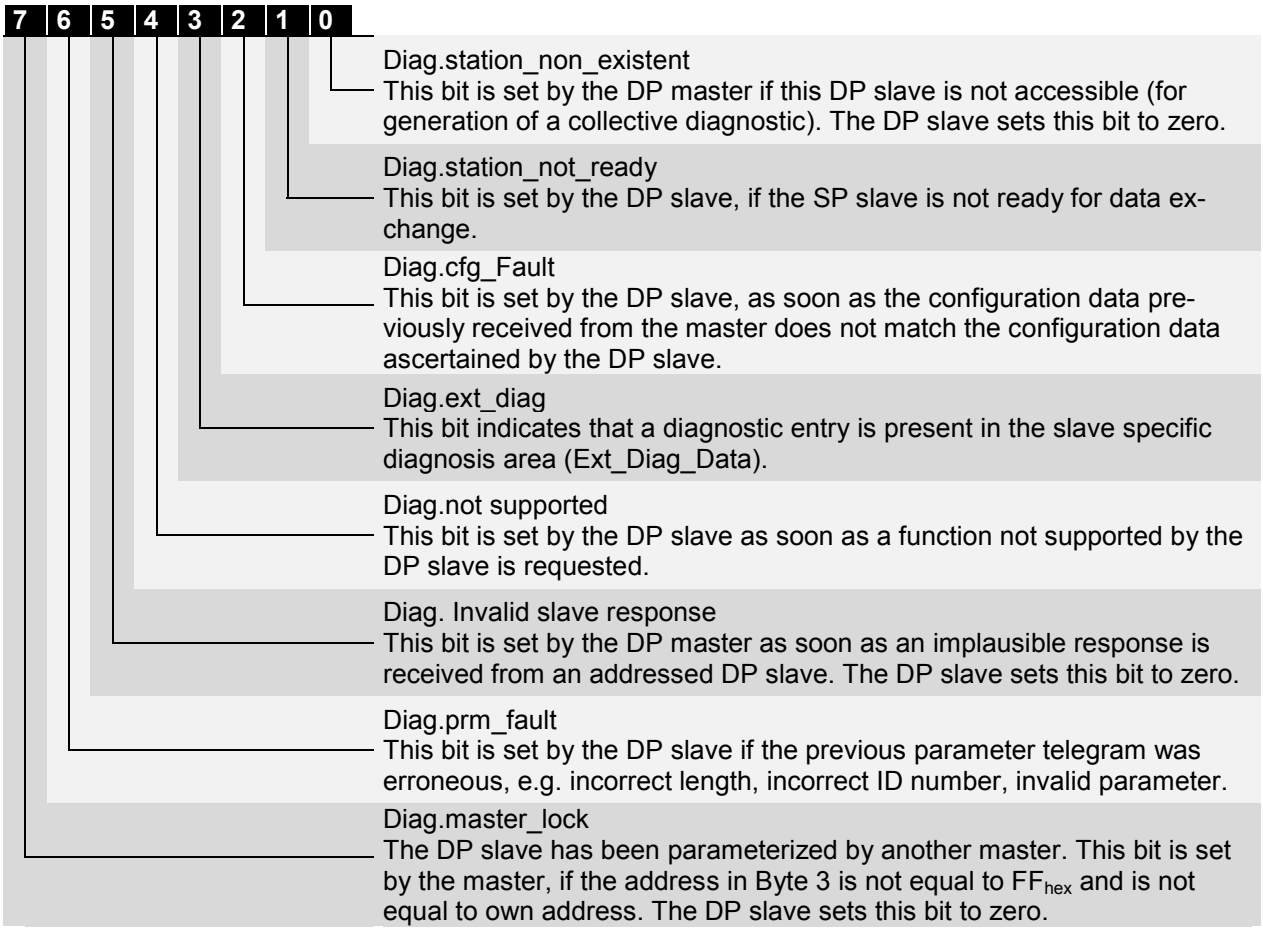

7 6 5 4 3 2 1 0
Diag.station_non_existent
This bit is set by the DP master if this DP slave is not accessible (for generation of a collective diagnostic). The DP slave sets this bit to zero.
Diag.station_not_ready
This bit is set by the DP slave, if the SP slave is not ready for data exchange.
Diag.cfg_Fault
This bit is set by the DP slave, as soon as the configuration data previously received from the master does not match the configuration data ascertained by the DP slave.
Diag.ext_diag
This bit indicates that a diagnostic entry is present in the slave specific diagnosis area (Ext_Diag_Data).
Diag.not supported
This bit is set by the DP slave as soon as a function not supported by the DP slave is requested.
Diag. Invalid slave response
This bit is set by the DP master as soon as an implausible response is received from an addressed DP slave. The DP slave sets this bit to zero.
Diag.prm_fault
This bit is set by the DP slave if the previous parameter telegram was erroneous, e.g. incorrect length, incorrect ID number, invalid parameter.
Diag.master_lock
The DP slave has been parameterized by another master. This bit is set by the master, if the address in Byte 3 is not equal to FF$_{hex}$ and is not equal to own address. The DP slave sets this bit to zero.

Fig. 21: Byte 0 bis 5 : Standard Diagnostic Information

Byte 1

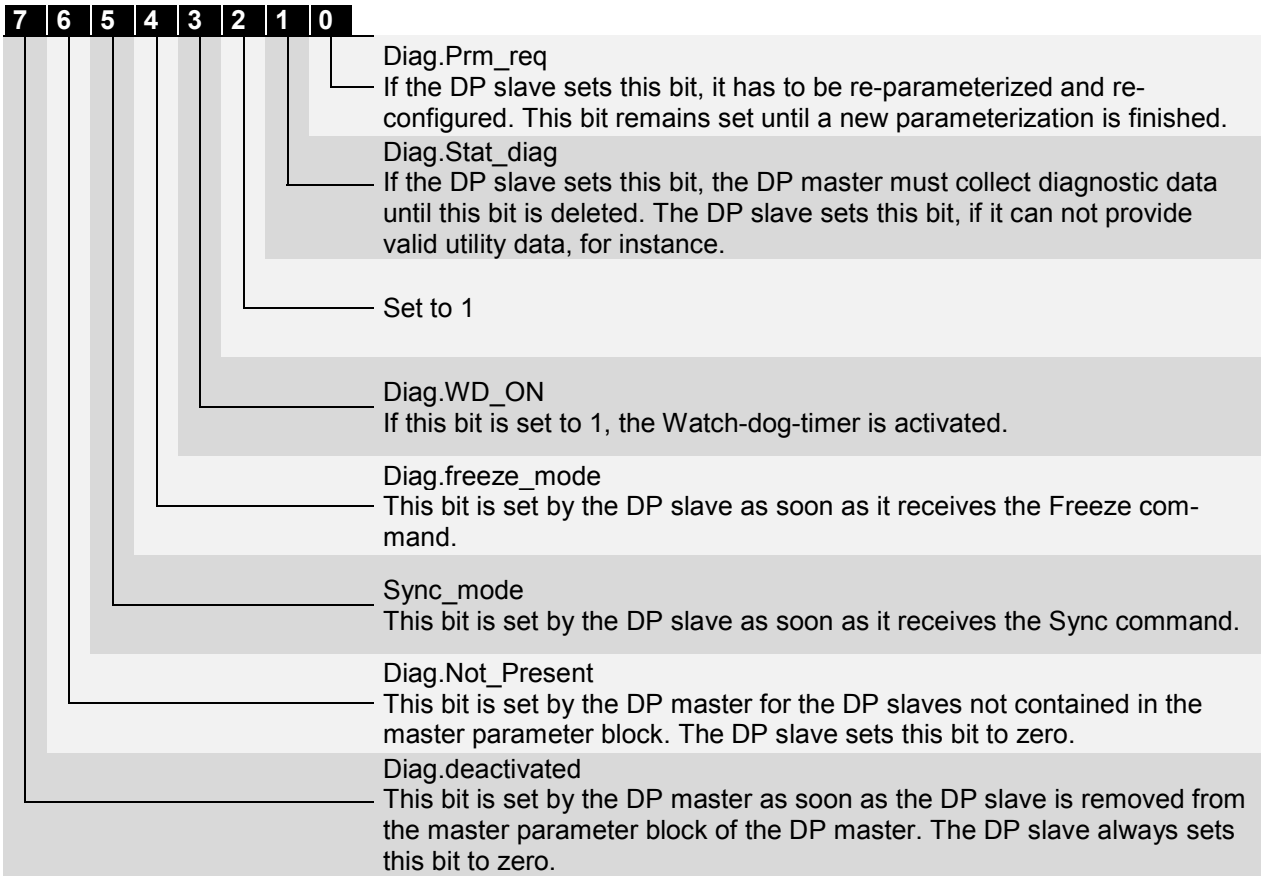

7 6 5 4 3 2 1 0
Diag.Prm_req
If the DP slave sets this bit, it has to be re-parameterized and re-configured. This bit remains set until a new parameterization is finished.
Diag.Stat_diag
If the DP slave sets this bit, the DP master must collect diagnostic data until this bit is deleted. The DP slave sets this bit, if it can not provide valid utility data, for instance.
Set to 1
Diag.WD_ON
If this bit is set to 1, the Watch-dog-timer is activated.
Diag.freeze_mode
This bit is set by the DP slave as soon as it receives the Freeze command.
Sync_mode
This bit is set by the DP slave as soon as it receives the Sync command.
Diag.Not_Present
This bit is set by the DP master for the DP slaves not contained in the master parameter block. The DP slave sets this bit to zero.
Diag.deactivated
This bit is set by the DP master as soon as the DP slave is removed from the master parameter block of the DP master. The DP slave always sets this bit to zero.

Fig. 22: Byte 1

Byte 2

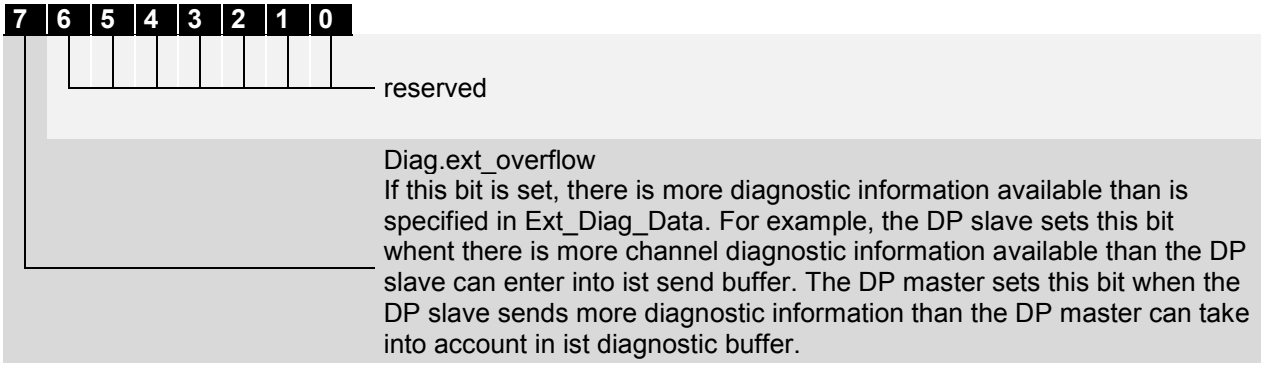

7 6 5 4 3 2 1 0
reserved
Diag.ext_overflow
If this bit is set, there is more diagnostic information available than is specified in Ext_Diag_Data. For example, the DP slave sets this bit whent there is more channel diagnostic information available than the DP slave can enter into ist send buffer. The DP master sets this bit when the DP slave sends more diagnostic information than the DP master can take into account in ist diagnostic buffer.

Fig. 23: Byte 2

Byte 3

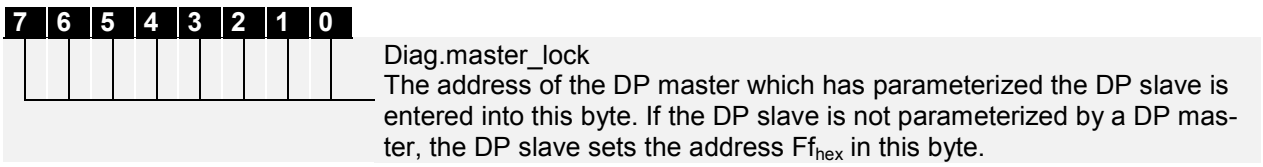

7 6 5 4 3 2 1 0
Diag.master_lock
The address of the DP master which has parameterized the DP slave is entered into this byte. If the DP slave is not parameterized by a DP master, the DP slave sets the address Ff_{hex} in this byte.

Fig. 24: Byte 3

Byte 4

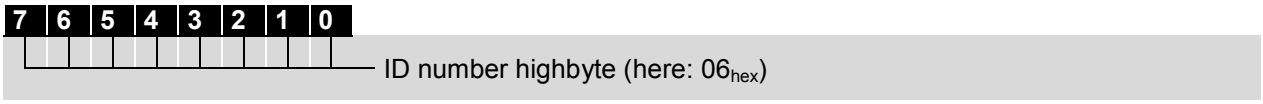


Fig. 25: Byte 4

Byte 5

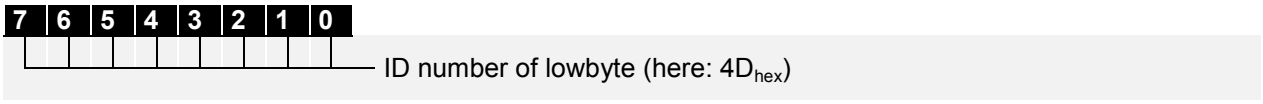


Fig. 26: Byte 5

5.4.2.2 Station-related Diagnostic Byte 6 to 25

Byte 6 Device-related diagnostic - headerbyte

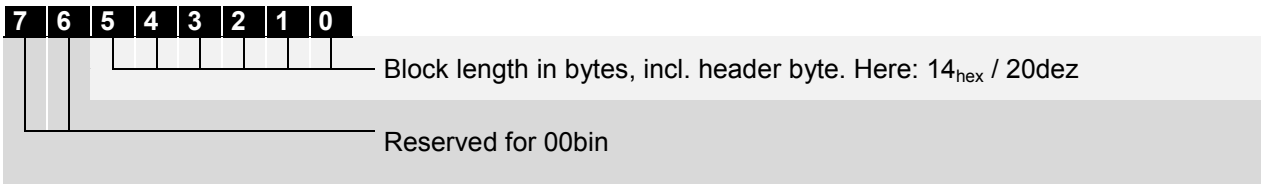


Fig. 27: Byte 6

5.4.2.2.1. System-wide Diagnostic Byte 7 to 9

Byte 7 Bus node

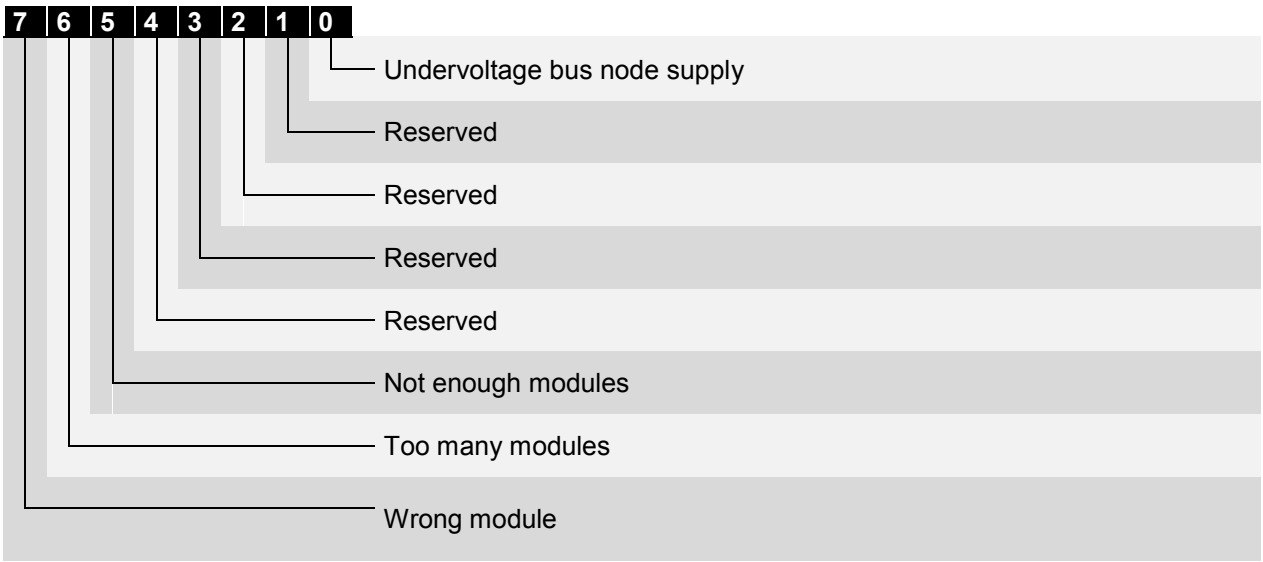


Fig. 28: Byte 7

Byte 8 System voltages

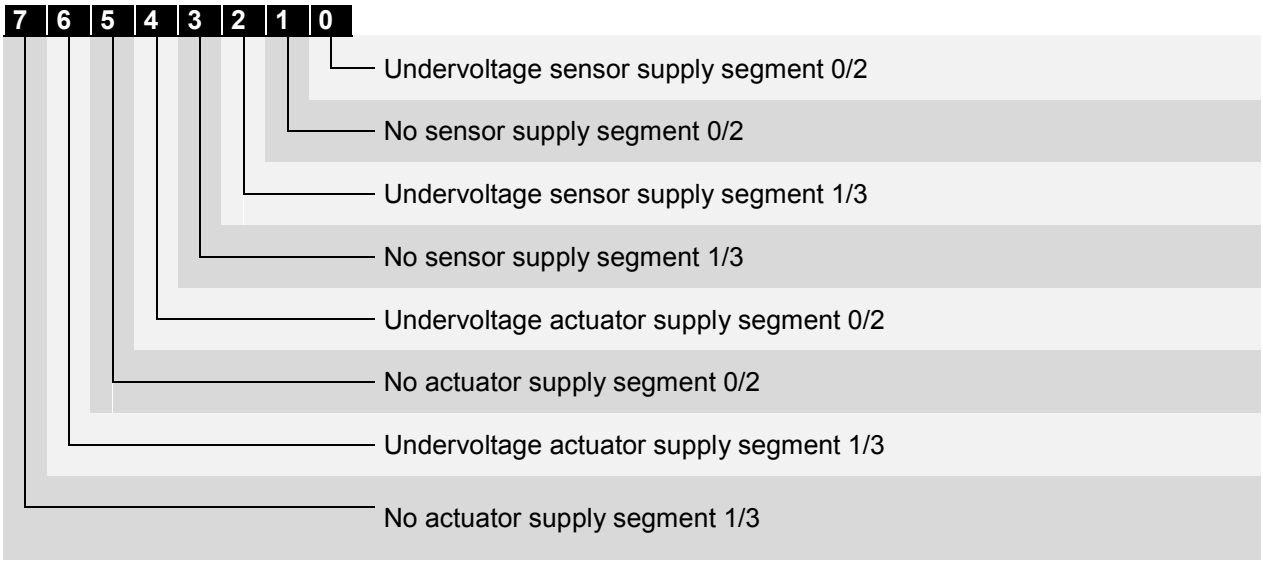

7 6 5 4 3 2 1 0
Undervoltage sensor supply segment 0/2
No sensor supply segment 0/2
Undervoltage sensor supply segment 1/3
No sensor supply segment 1/3
Undervoltage actuator supply segment 0/2
No actuator supply segment 0/2
Undervoltage actuator supply segment 1/3
No actuator supply segment 1/3

Fig. 29: Byte 8

Byte 9 Short-circuit / Overload System Voltages

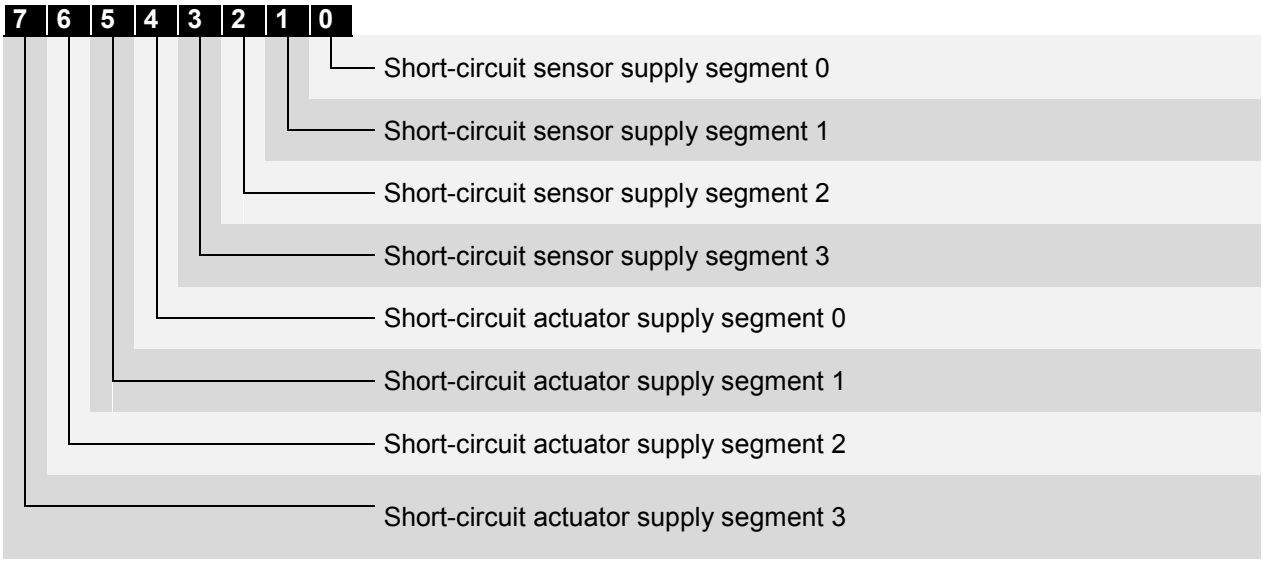

7 6 5 4 3 2 1 0
Short-circuit sensor supply segment 0
Short-circuit sensor supply segment 1
Short-circuit sensor supply segment 2
Short-circuit sensor supply segment 3
Short-circuit actuator supply segment 0
Short-circuit actuator supply segment 1
Short-circuit actuator supply segment 2
Short-circuit actuator supply segment 3

Fig. 30: Byte 9

5.4.2.2.2. Module-related Diagnostic Byte 10 to 25

If placeholders have been inserted into the configuration, they are also counted when module-related diagnostic messages are numbered.

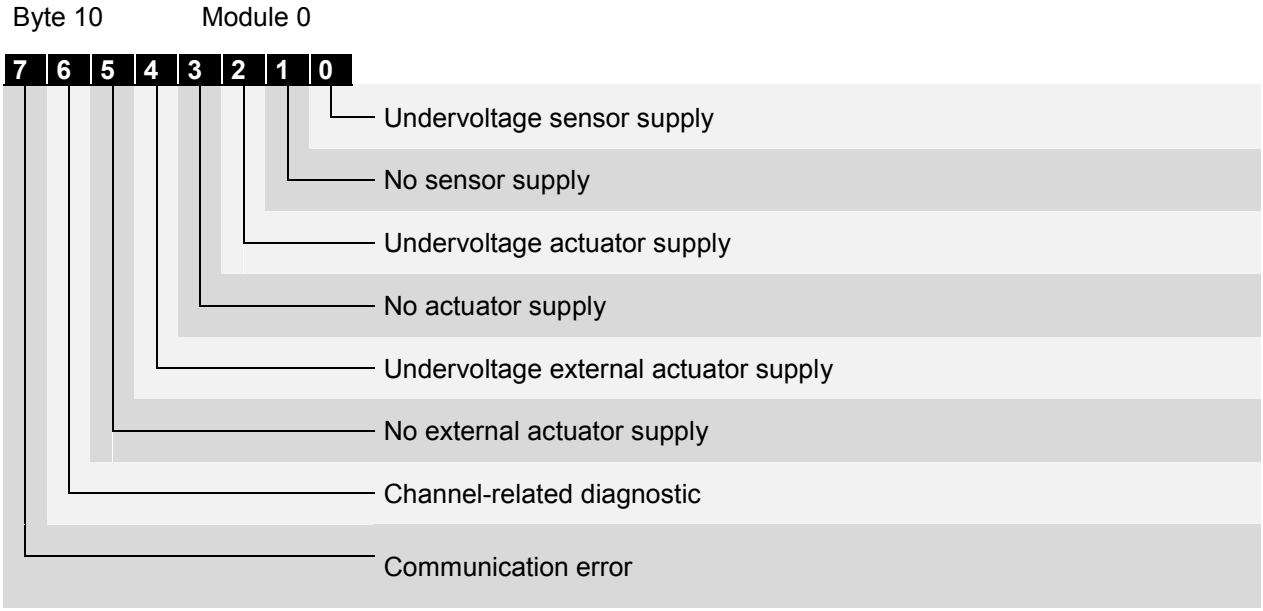


Fig. 31: Byte 10

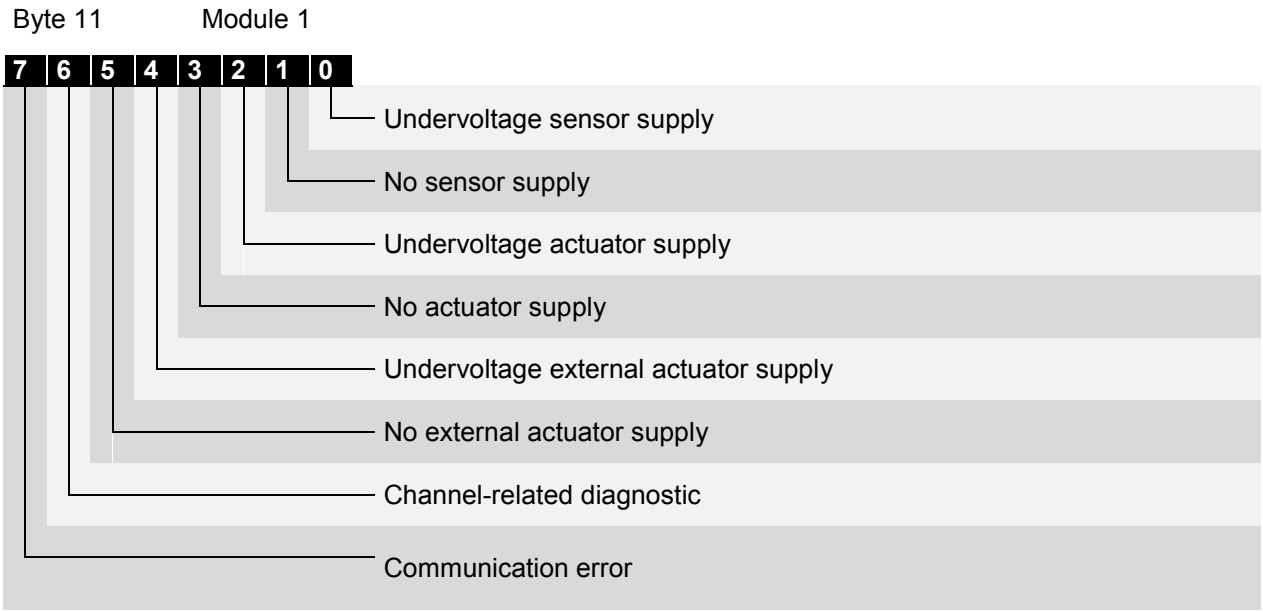


Fig. 32: Byte 11

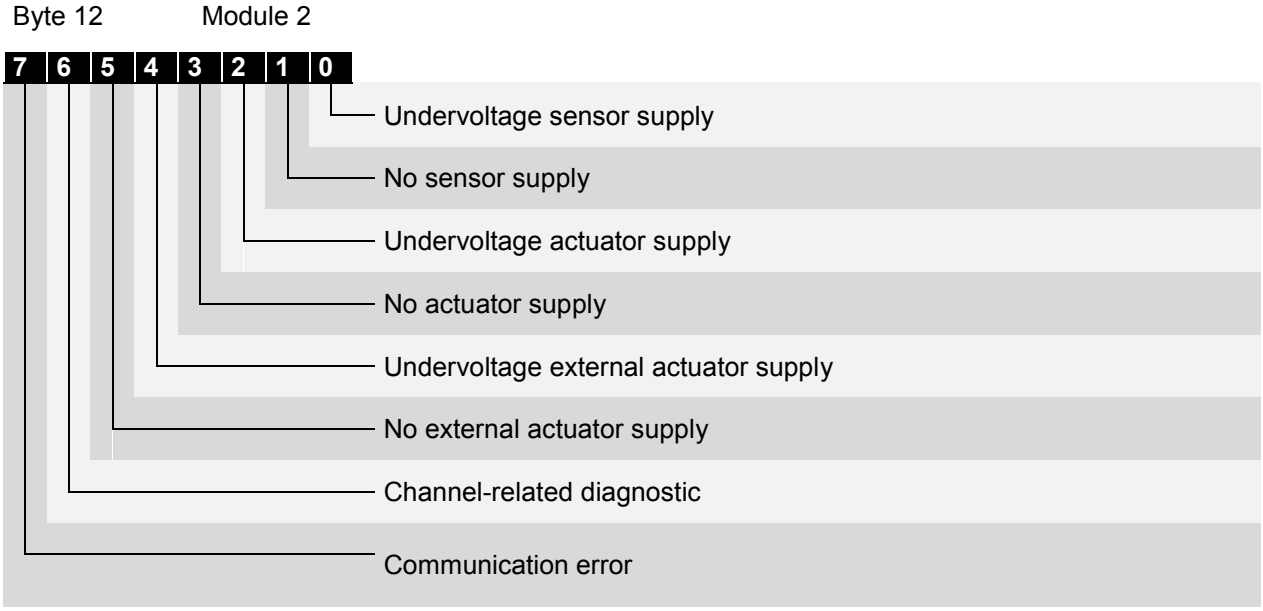


Fig. 33: Byte 12

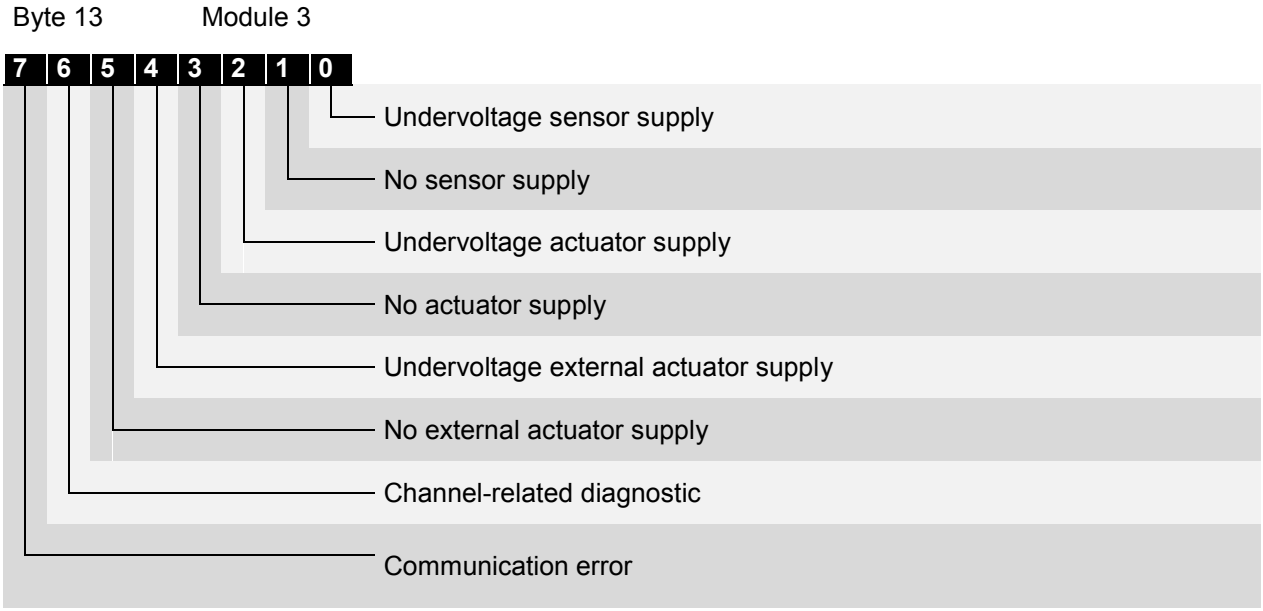


Fig. 34: Byte 13

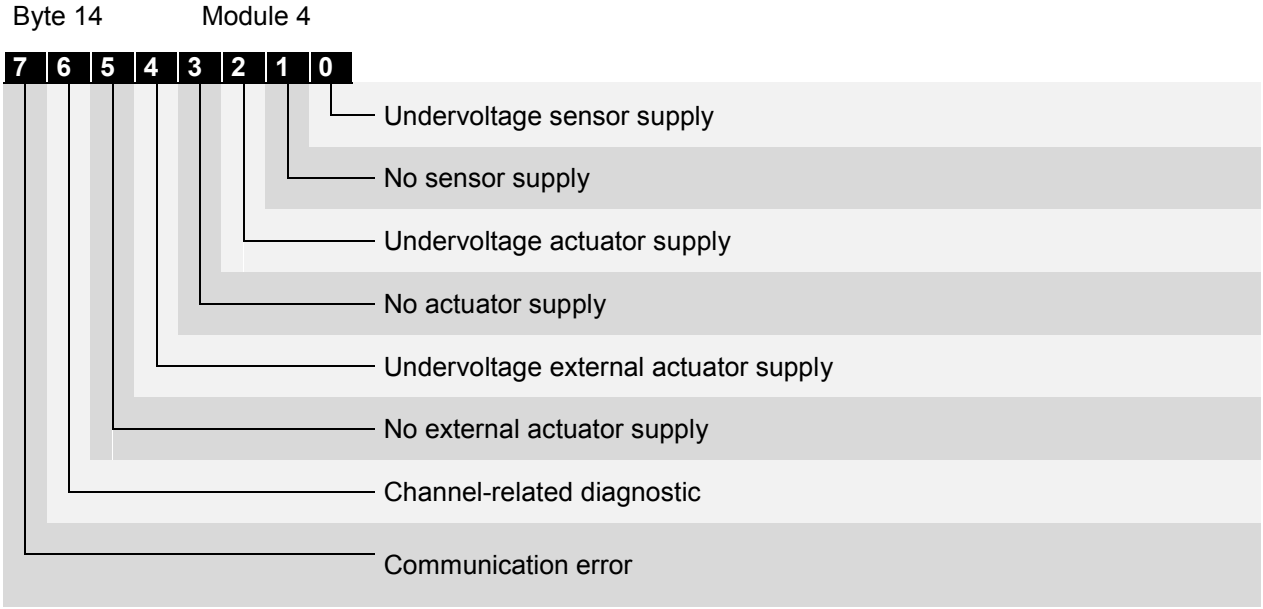


Fig. 35: Byte 14

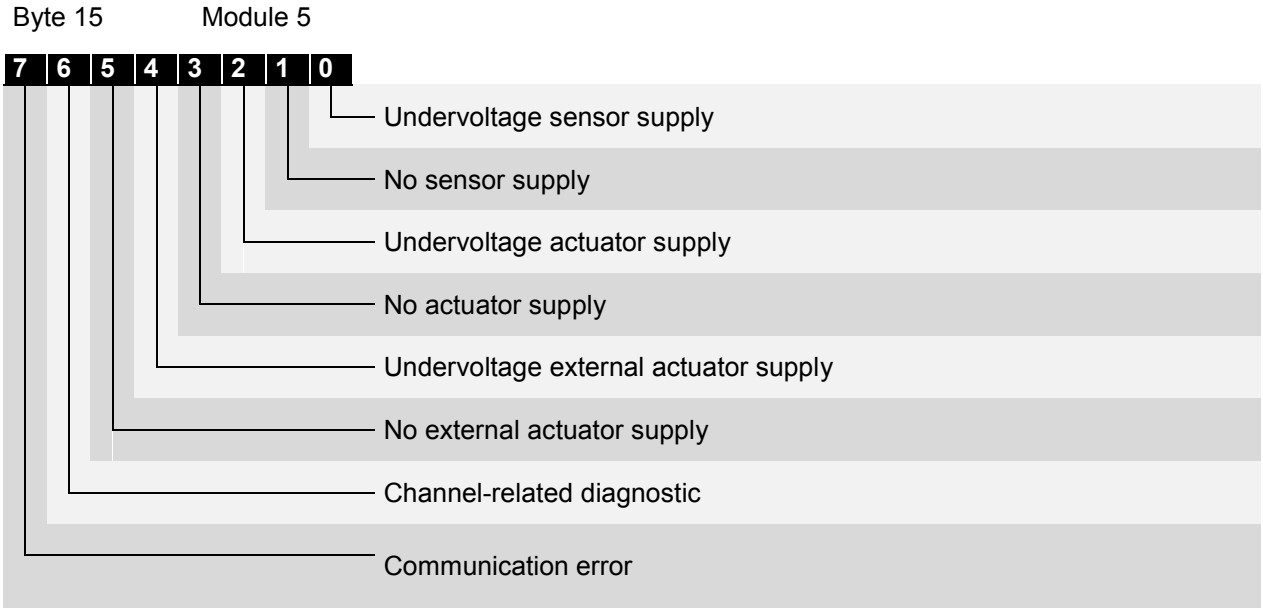


Fig. 36: Byte 15

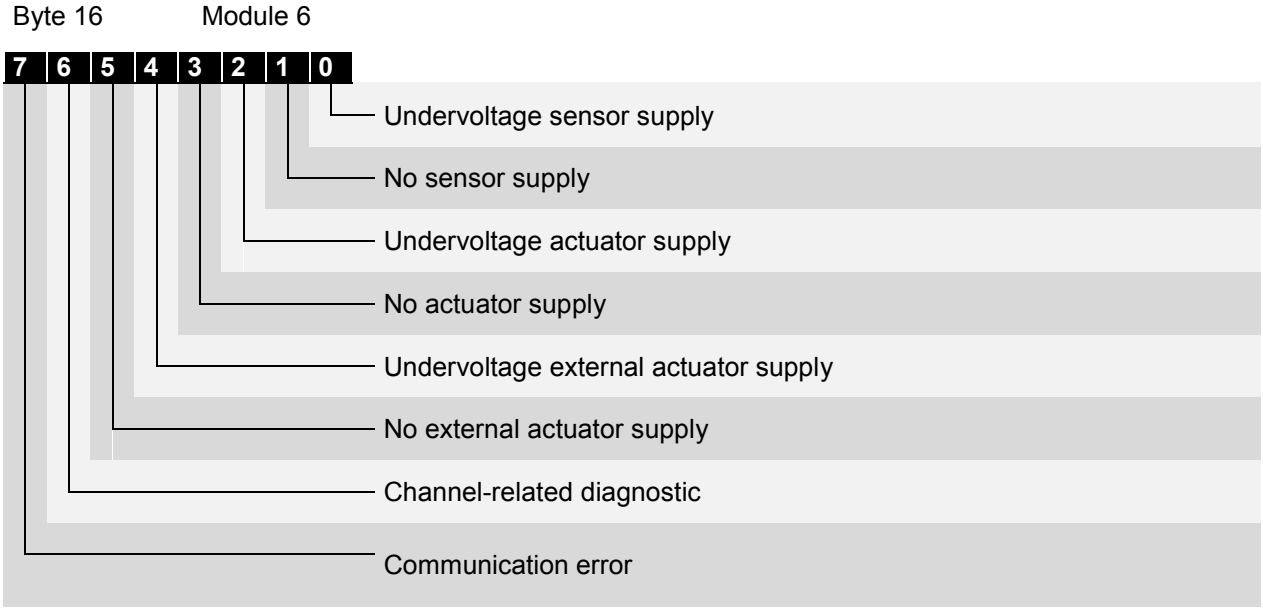


Fig. 37: Byte 16

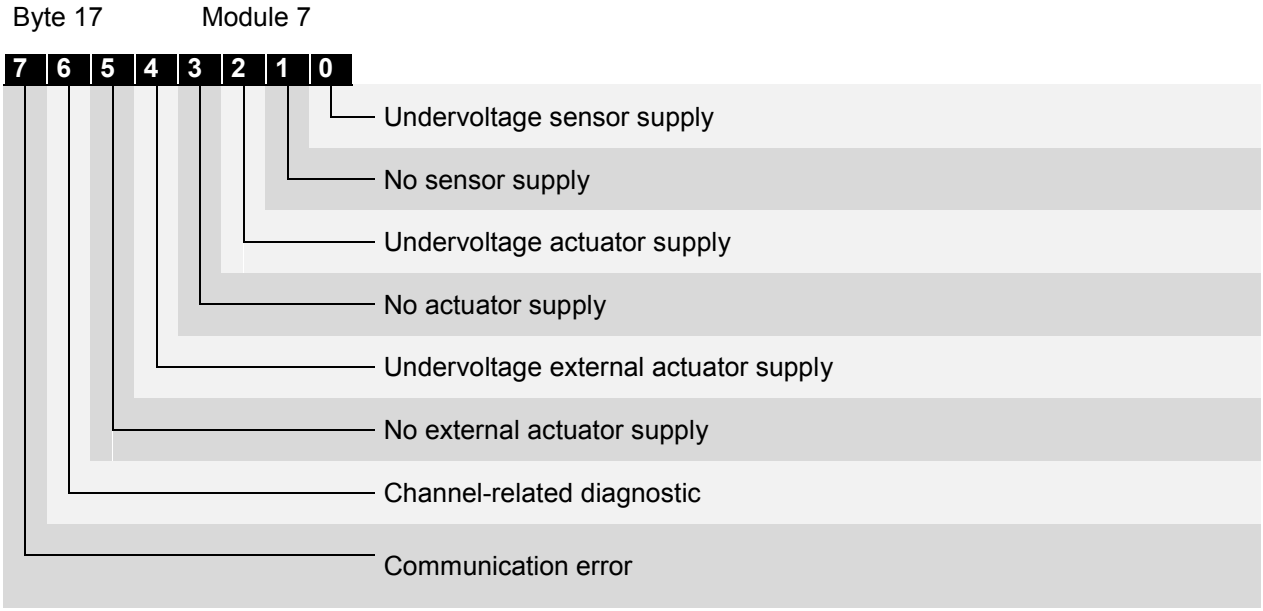


Fig. 38: Byte 17

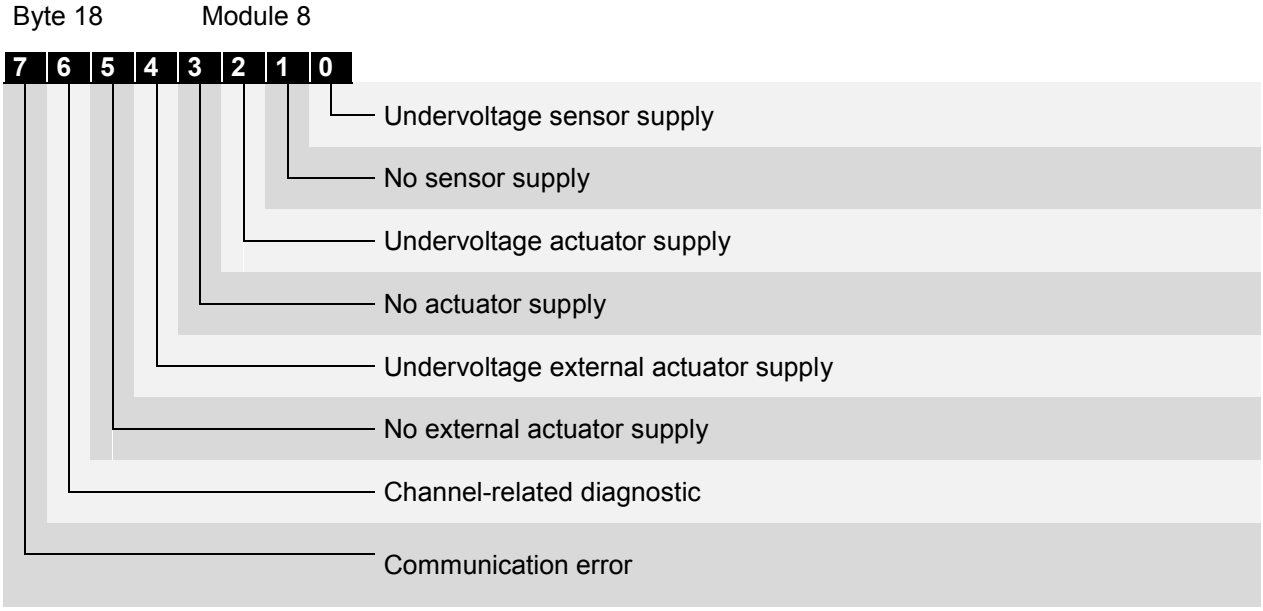


Fig. 39: Byte 18

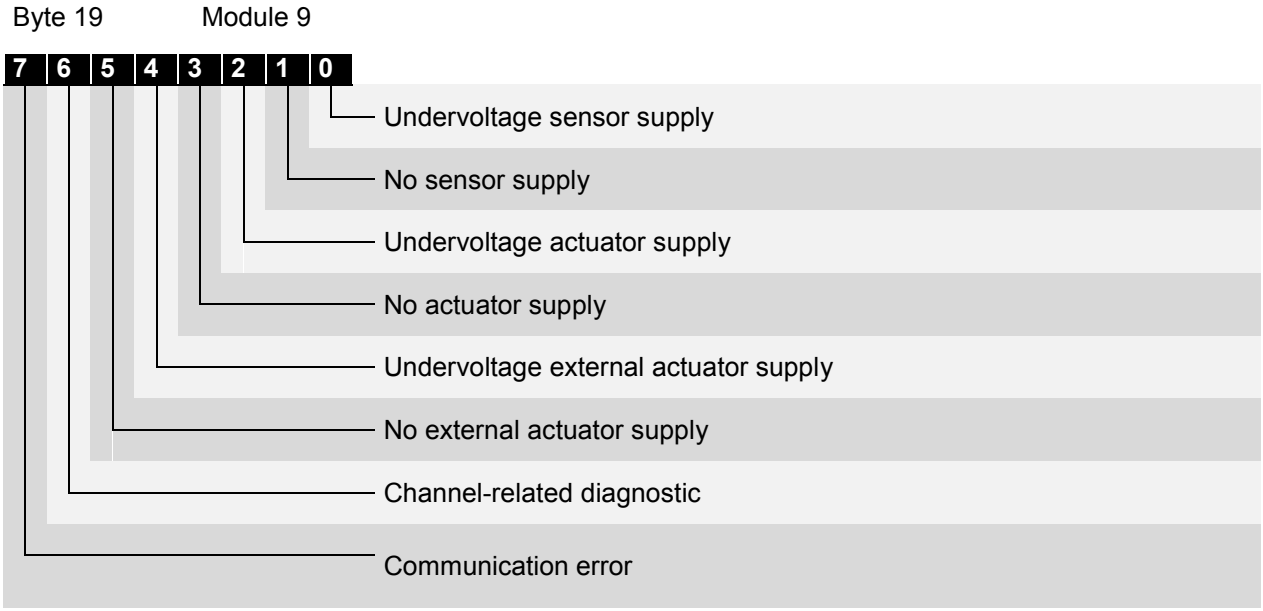


Fig. 40: Byte 19

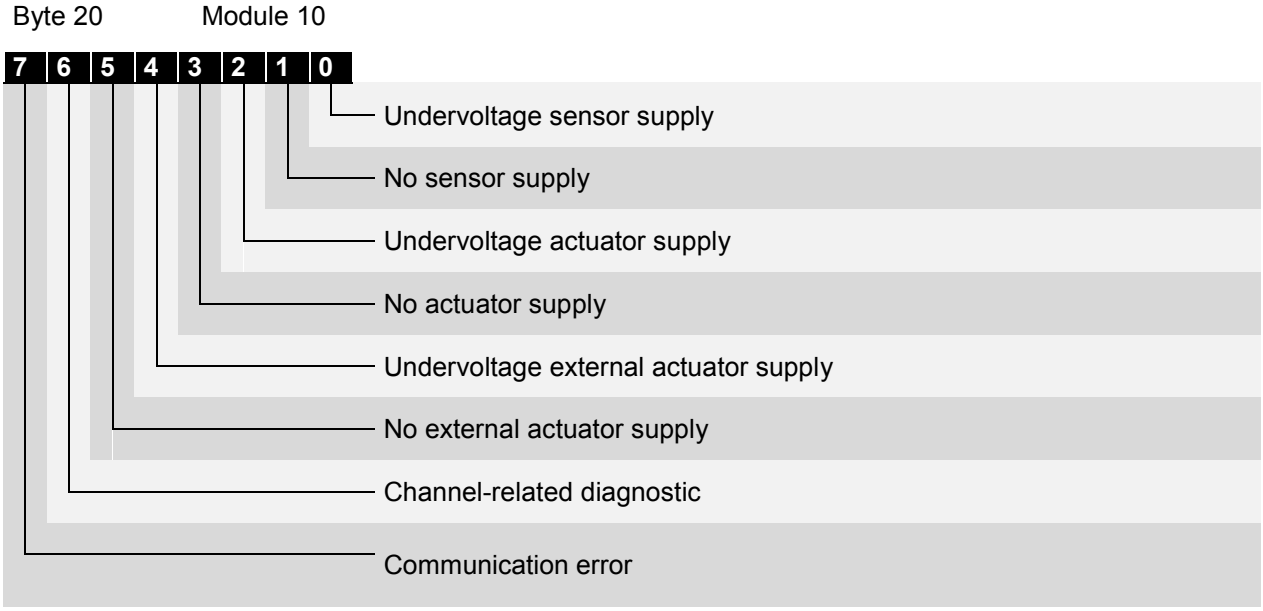


Fig. 41: Byte 20

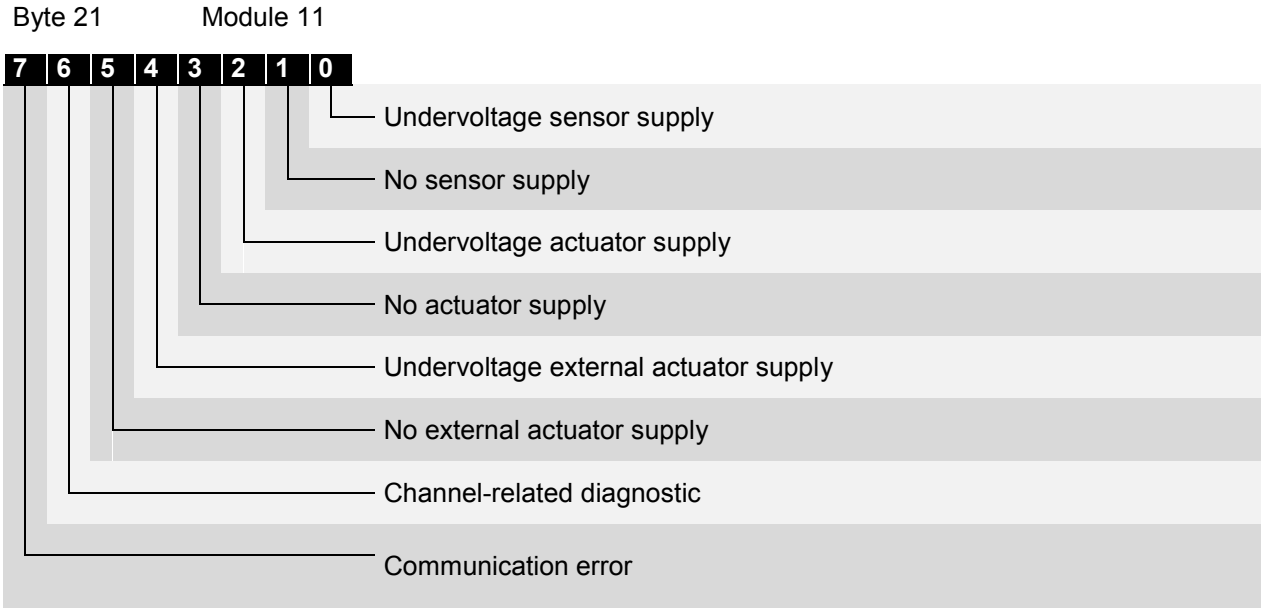


Fig. 42: Byte 21

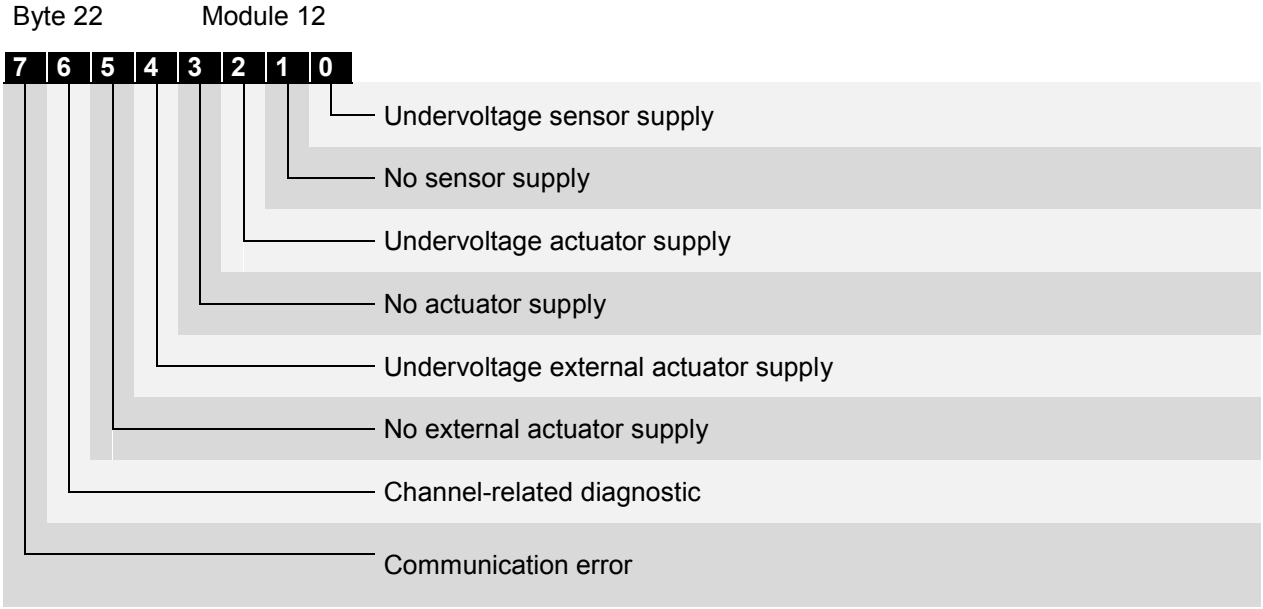


Fig. 43: Byte 22

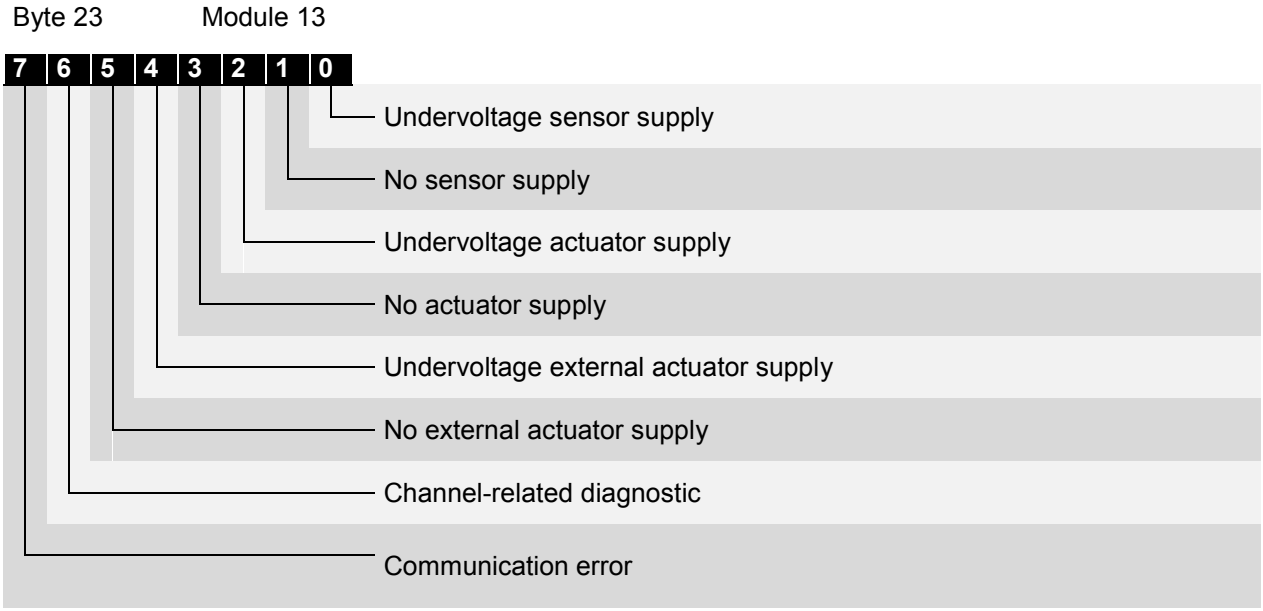


Fig. 44: Byte 23

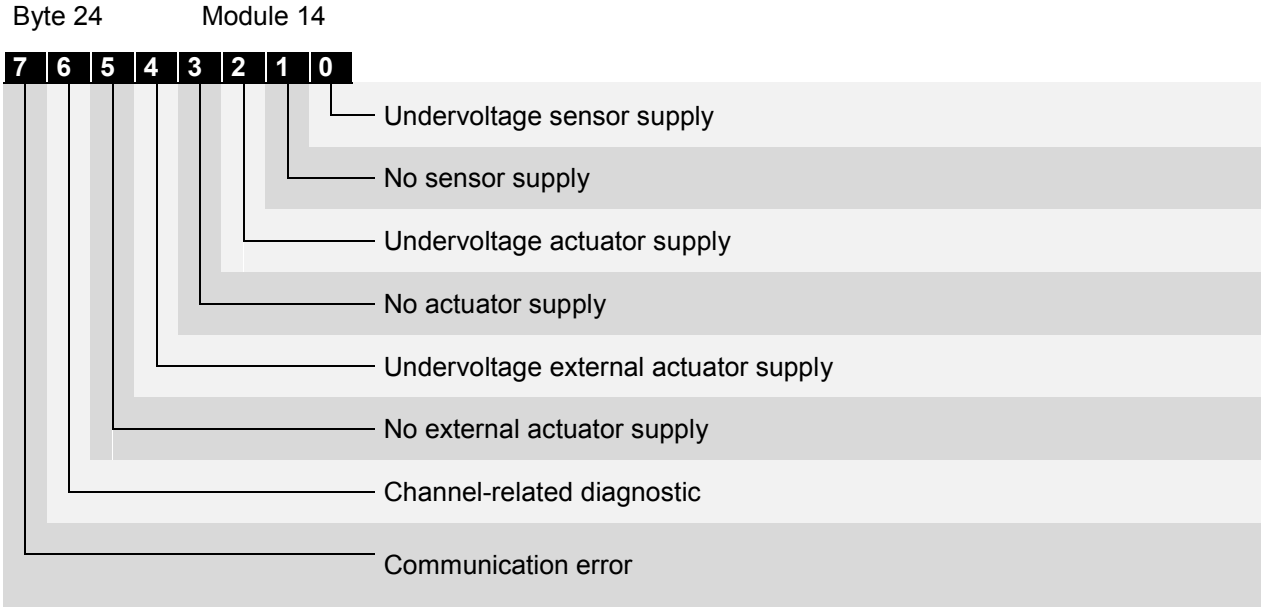


Fig. 45: Byte 24

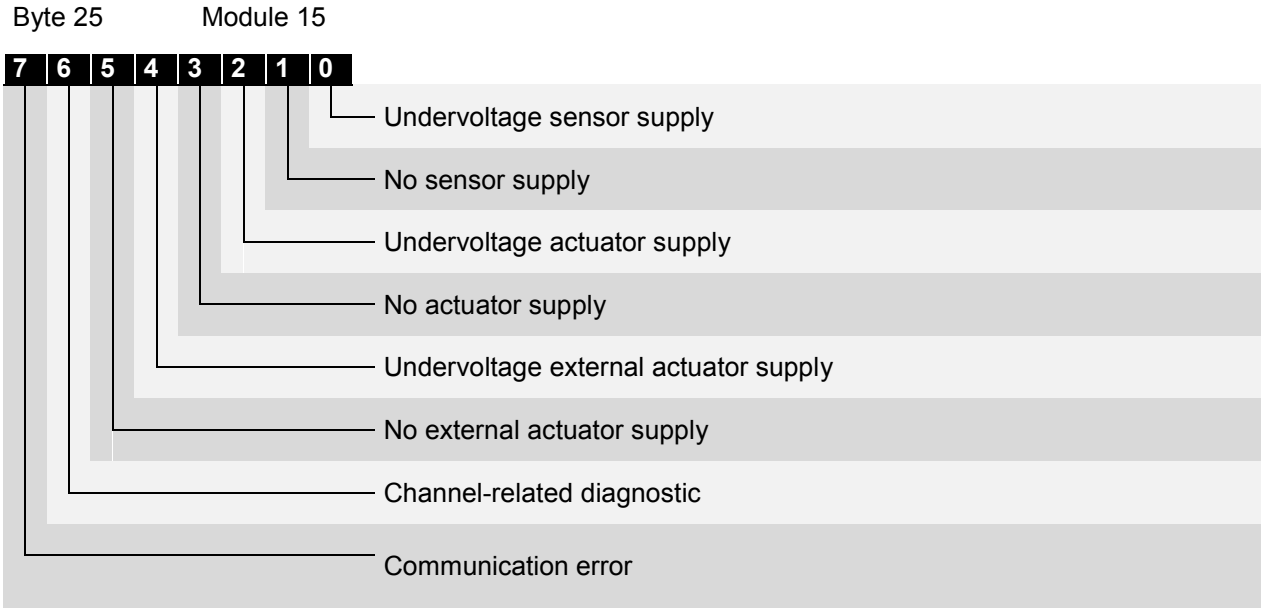


Fig. 46: Byte 25

5.4.2.3 ID-related diagnostic bytes 26 to 28

Byte 26 ID-related diagnostic (header byte)

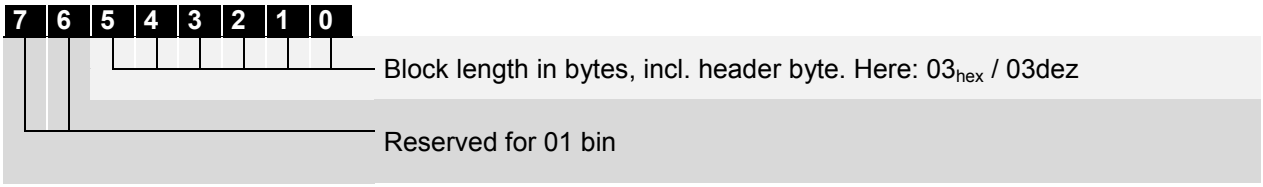


Fig. 47: Byte 26

Byte 27 Identification

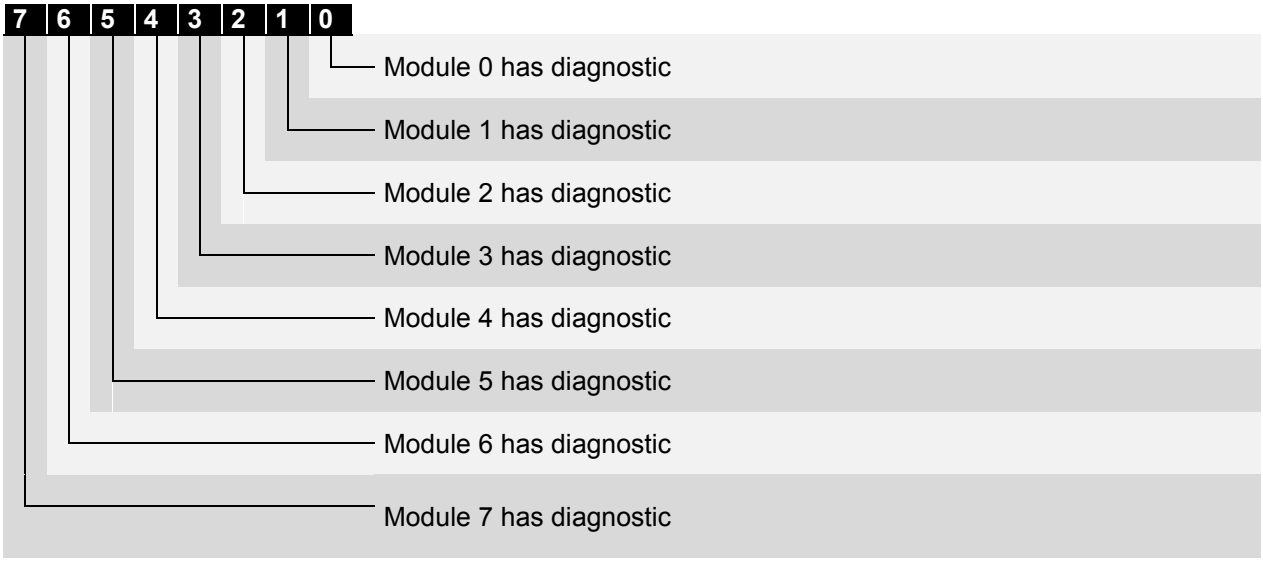

7 6 5 4 3 2 1 0
Module 0 has diagnostic
Module 1 has diagnostic
Module 2 has diagnostic
Module 3 has diagnostic
Module 4 has diagnostic
Module 5 has diagnostic
Module 6 has diagnostic
Module 7 has diagnostic

Fig. 48: Byte 27

Byte 28 Identification

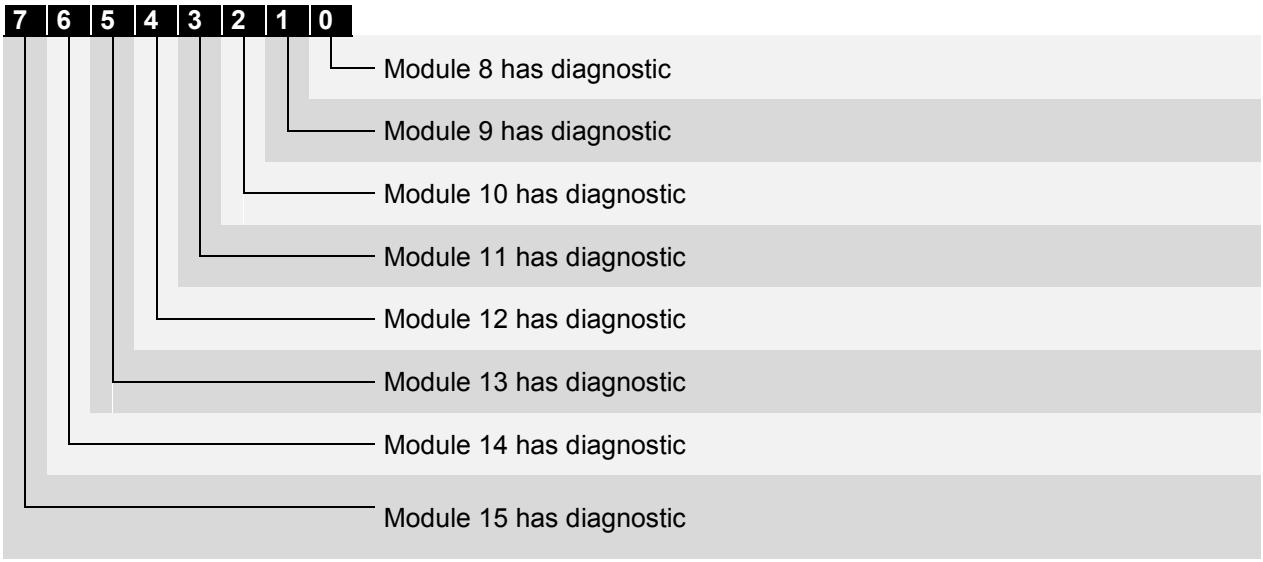

7 6 5 4 3 2 1 0
Module 8 has diagnostic
Module 9 has diagnostic
Module 10 has diagnostic
Module 11 has diagnostic
Module 12 has diagnostic
Module 13 has diagnostic
Module 14 has diagnostic
Module 15 has diagnostic

Fig. 49: Byte 28

5.4.2.4 Channel-related diagnostic byte 29 to 31 and following

Three bytes are assigned in the diagnostic message for each channel-related diagnostic. If, for example, 5 channel-related diagnostics ar available, a total of 5 * 3 = 15 bytes channel-related diagnostic information will follow from byte 29.

Byte 29 ID number

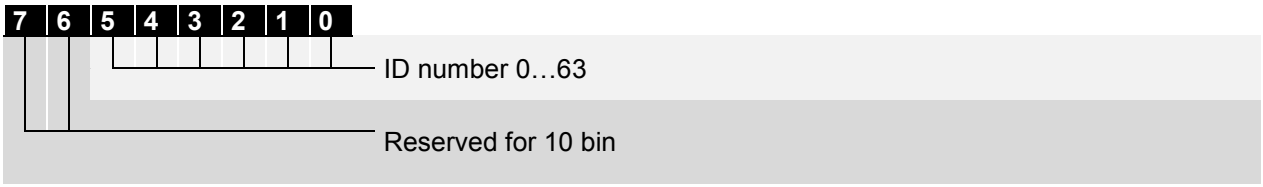


Fig. 50: Byte 29

Byte 30 Channel number

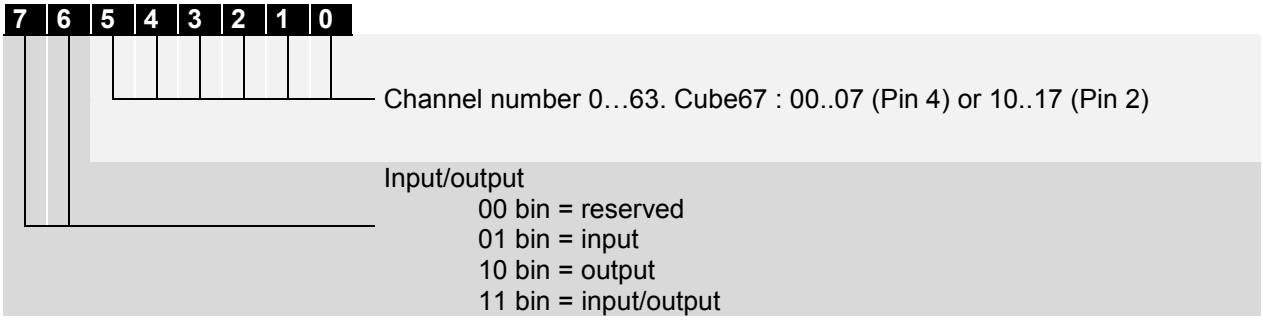

7 6 5 4 3 2 1 0
Channel number 0…63. Cube67 : 00..07 (Pin 4) or 10..17 (Pin 2)
Input/output
00 bin = reserved
01 bin = input
10 bin = output
11 bin = input/output

Fig. 51: Byte 30

Byte 31 Fault type

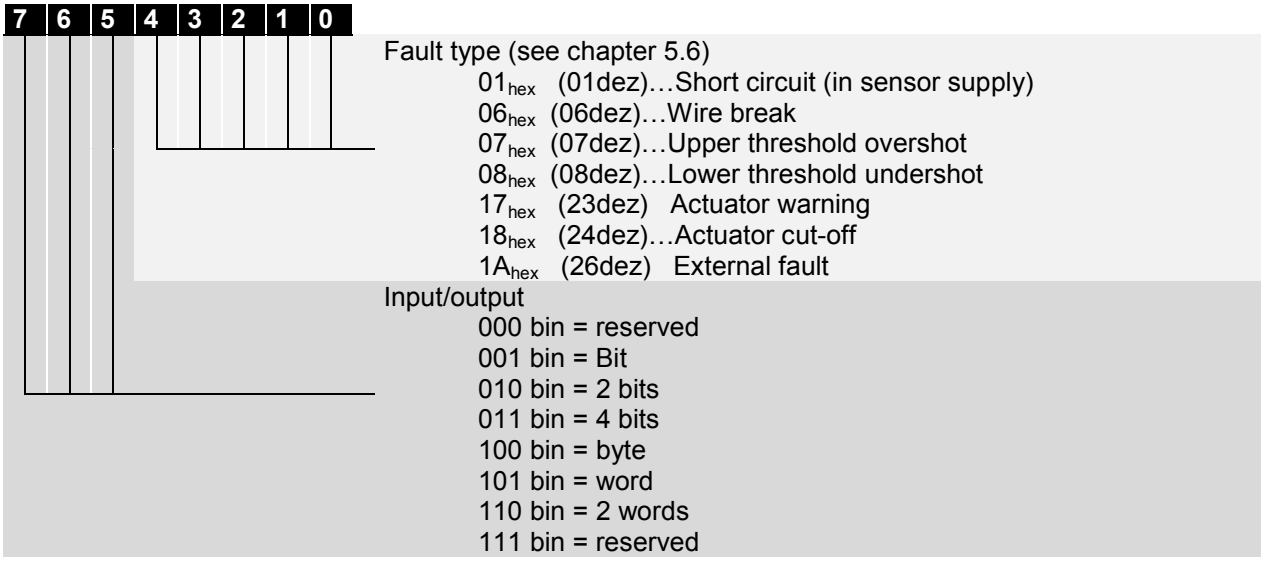

7 6 5 4 3 2 1 0
Fault type (see chapter 5.6)
01hex (01dez)…Short circuit (in sensor supply)
06hex (06dez)…Wire break
07hex (07dez)…Upper threshold overshot
08hex (08dez)…Lower threshold undershot
17hex (23dez) Actuator warning
18hex (24dez)…Actuator cut-off
1Ahex (26dez) External fault
Input/output
000 bin = reserved
001 bin = Bit
010 bin = 2 bits
011 bin = 4 bits
100 bin = byte
101 bin = word
110 bin = 2 words
111 bin = reserved

Fig. 52: Byte 31

5.4.2.4.1. Examples of Channel-related Diagnostic:

This example refers to module number 0. For another module number the 1st byte will be accordingly higher (81_{hex}, 82_{hex}…).

Short-circuit in sensor supply			
Channel	**1st byte**	**2nd byte**	**3rd byte**
00 – Pin 4 Sock. 0	80_{hex}	40_{hex}	21_{hex}
01 – Pin 4 Sock. 1	80_{hex}	41_{hex}	21_{hex}
02 – Pin 4 Sock. 2	80_{hex}	42_{hex}	21_{hex}
03 – Pin 4 Sock. 3	80_{hex}	43_{hex}	21_{hex}
04 – Pin 4 Sock. 4	80_{hex}	44_{hex}	21_{hex}
05 – Pin 4 Sock. 5	80_{hex}	45_{hex}	21_{hex}
06 – Pin 4 Sock. 6	80_{hex}	46_{hex}	21_{hex}
07 – Pin 4 Sock. 7	80_{hex}	47_{hex}	21_{hex}
10 – Pin 2 Sock. 0	80_{hex}	$4A_{hex}$	21_{hex}
11 – Pin 2 Sock. 1	80_{hex}	$4B_{hex}$	21_{hex}
12 – Pin 2 Sock. 2	80_{hex}	$4C_{hex}$	21_{hex}
13 – Pin 2 Sock. 3	80_{hex}	$4D_{hex}$	21_{hex}
14 – Pin 2 Sock. 4	80_{hex}	$4E_{hex}$	21_{hex}
15 – Pin 2 Sock. 5	80_{hex}	$4F_{hex}$	21_{hex}
16 – Pin 2 Sock. 6	80_{hex}	50_{hex}	21_{hex}
17 – Pin 2 Sock. 7	80_{hex}	51_{hex}	21_{hex}

Actuator cut-off			
Channel	**1st byte**	**2nd byte**	**3rd byte**
00 – Pin 4 Sock. 0	80_{hex}	80_{hex}	38_{hex}
01 – Pin 4 Sock. 1	80_{hex}	81_{hex}	38_{hex}
02 – Pin 4 Sock. 2	80_{hex}	82_{hex}	38_{hex}
03 – Pin 4 Sock. 3	80_{hex}	83_{hex}	38_{hex}
04 – Pin 4 Sock. 4	80_{hex}	84_{hex}	38_{hex}
05 – Pin 4 Sock. 5	80_{hex}	85_{hex}	38_{hex}
06 – Pin 4 Sock. 6	80_{hex}	86_{hex}	38_{hex}
07 – Pin 4 Sock. 7	80_{hex}	87_{hex}	38_{hex}
10 – Pin 2 Sock. 0	80_{hex}	$8A_{hex}$	38_{hex}
11 – Pin 2 Sock. 1	80_{hex}	$8B_{hex}$	38_{hex}
12 – Pin 2 Sock. 2	80_{hex}	$8C_{hex}$	38_{hex}
13 – Pin 2 Sock. 3	80_{hex}	$8D_{hex}$	38_{hex}
14 – Pin 2 Sock. 4	80_{hex}	$8E_{hex}$	38_{hex}
15 – Pin 2 Sock. 5	80_{hex}	$8F_{hex}$	38_{hex}
16 – Pin 2 Sock. 6	80_{hex}	90_{hex}	38_{hex}
17 – Pin 2 Sock. 7	80_{hex}	91_{hex}	38_{hex}

Actuator warning			
Channel	**1st byte**	**2nd byte**	**3rd byte**
00 – Pin 4 Sock. 0	80_{hex}	80_{hex}	37_{hex}
01 – Pin 4 Sock. 1	80_{hex}	81_{hex}	37_{hex}
02 – Pin 4 Sock. 2	80_{hex}	82_{hex}	37_{hex}
03 – Pin 4 Sock. 3	80_{hex}	83_{hex}	37_{hex}
04 – Pin 4 Sock. 4	80_{hex}	84_{hex}	37_{hex}
05 – Pin 4 Sock. 5	80_{hex}	85_{hex}	37_{hex}
06 – Pin 4 Sock. 6	80_{hex}	86_{hex}	37_{hex}
07 – Pin 4 Sock. 7	80_{hex}	87_{hex}	37_{hex}
10 – Pin 2 Sock. 0	80_{hex}	$8A_{hex}$	37_{hex}
11 – Pin 2 Sock. 1	80_{hex}	$8B_{hex}$	37_{hex}
12 – Pin 2 Sock. 2	80_{hex}	$8C_{hex}$	37_{hex}
13 – Pin 2 Sock. 3	80_{hex}	$8D_{hex}$	37_{hex}
14 – Pin 2 Sock. 4	80_{hex}	$8E_{hex}$	37_{hex}
15 – Pin 2 Sock. 5	80_{hex}	$8F_{hex}$	37_{hex}
16 – Pin 2 Sock. 6	80_{hex}	90_{hex}	37_{hex}
17 – Pin 2 Sock. 7	80_{hex}	91_{hex}	37_{hex}

External fault			
Channel	**1st byte**	**2nd byte**	**3rd byte**
10 – Pin 2 Sock. 0	80_{hex}	$4A_{hex}$	$3A_{hex}$
11 – Pin 2 Sock. 1	80_{hex}	$4B_{hex}$	$3A_{hex}$
12 – Pin 2 Sock. 2	80_{hex}	$4C_{hex}$	$3A_{hex}$
13 – Pin 2 Sock. 3	80_{hex}	$4D_{hex}$	$3A_{hex}$
14 – Pin 2 Sock. 4	80_{hex}	$4E_{hex}$	$3A_{hex}$
15 – Pin 2 Sock. 5	80_{hex}	$4F_{hex}$	$3A_{hex}$
16 – Pin 2 Sock. 6	80_{hex}	50_{hex}	$3A_{hex}$
17 – Pin 2 Sock. 7	80_{hex}	51_{hex}	$3A_{hex}$

5.5 Evaluation of the Diagnostic Messages in the PLC

Access to the data of the diagnostic message depends on the DP master used. Please refer to the relevant documentation.

Siemens offers functional modules for its PLCs that facilitate data evaluation. They can be ordered through Siemens' internet homepage.

5.6 Troubleshooting

This chapter describes possible failure characteristics and useful information for error correction.

5.6.1 Troubleshooting in a ProfiBus Network

Below we listed the most current errors in a ProfiBus network. This list is not exhaustive. For checking correct installation, different manufacturers offer many useful diagnostic tools (line tester, ProfiBus tester, ProfiBus monitor).

Error	DP diagnostic	LED Displays	Possible cause	Solution
Station is not accessible or communication error	No slave reply	Flashing BusRun LED on the bus node. If the module is not supplied, all LEDs are off.	Station without supply.	Supply station.
			No address or invalid address set.	Set correct address.
			The set address is already used.	Every ProfiBus segment must have an explicit and unique address
			Terminating resistor between master and station is switched on.	I.d.R werden bei Einschalten des Abschlusswiderstands in einem ProfiBusstecker die nachfolgenden Teilnehmer vom ProfiBus getrennt. Überprüfen Sie, dass ausschließlich an den Enden des ProfiBus-Segements die Abschlusswiderstände eingeschaltet sind.
			Wrong termination of the ProfiBus segment	Both ends of a ProfiBus segment must be fitted with a terminal resistor. With low baud rates the network can apparently be operated despite wrong termination. This may cause sporadic faults during operation.
			Stub Lines Baud rates up to 1.5 Mbit/s max. 6.6m With higher baud rates, stub lines are not admissible.	If stub lines cannot be avaided, preferably use specific “active” stub lines or repeaters. Please note that the number of repeaters used in a segment is limited. Please refer to the relevant documentation of the repeater.
			Extension of the ProfiBus segment is too large. For addmissible cable lengths see table.	Use repeaters for dividing large segments into several segments.
Parameterization or configuration error	Standard diagnostic: Bit Diag.PrmFault or Bit Diag.CfgFault set.	- Flashing BusRun LED on the bus node. - CfgF LED on the bus node is red.	Projected modules differ from actually installed modules.	Check whether projected modules are actually present and correctly connected to the bux node.
			Error in the internal system connection	See chapter 4.4.

Error	DP diagnostic	LED Displays	Possible cause	Solution
Connection to the DP master interrupted during operation.	No slave reply	BusRun LED flashing	Short-circuit or interruption in the ProfiBus line.	Check the ProfiBus line. Check which stations are still accessible in order to locate the error. (Preferably use the system with lower baud rate.)

Table 5-17: Troubleshooting in a ProfiBus Network

Baud rate in kBit/s	9.6	19.2	45.45	93.75	187.5	500	1500	3000	6000	12000
Cable length in m	1200	1200	1200	1200	1000	400	200	100	100	100

Tab. 54: Max. permissible cable lengths in a ProfiBus segment

5.6.2 Troubleshooting in the Internal System Connection

In addition to defective cables or faulty connections, please check the following points:

- The connected I/O modules must be in accordance with the configuration and guarantee replaceability.
- The order of I/O modules must be in accordance with the configured order.
- Connectors are screwed down.
- Use exclusively pre-wired Murrelektronik cables.
- Connection of functional ground and shield according to EMC requirements.
- System extension is limited to 5 m per segment. Without MICO or an equivalent selective working fuse the length per segment of the internal system connection must not exceed 5 m. The admissible length of the internal system connection of a segment may amount to maximum 10 m with the bus node an upstream MICO or an equivalent selective working fuse .
- The max. number of modules per segment is 4.

Error	DP diagnostic	LED Displays	Possible cause	Solution
Internal system connection interrupted	If the system was already in data exchange mode, communication error is reported for all modules not accessible. If the module has not yet exchanged data (startup) PrmFault or CfgFault is reported: planned configuration differs from actual one.	US LED on the corresponding I/O-module is off. US LED of the affected segment of the bus node is flashing. The US LEDs of accessible modules are flashing.	Error in the internal system connection	Replace cable.
			Connector of internal system connection not incorrectly connected.	Screw down the plug.
Communication error	If the system was already in data exchange mode, communication error is reported for all modules not accessible.	US LED on I/O module flashing US LED of the affected segment of the bus node is flashing.	Error in the internal system connection	Replace cable.
			Connector of internal system connection not incorrectly connected.	Screw down the plug.
			Segment of internal system connection is not terminated.	If the last module is an extension module, the extension interface of the internal system connection must always be fitted with a terminating resistance.
The module is not supplied.	See error: Internal system connection interrupted		Sensor supply of the I/O module is < 12 V.	Incerase the sensor supply voltage. Observe max. values.

Tab. 55: Troubleshooting in the Internal System Connection

5.7 Diagnostic and Configuration Check

5.7.1 General Information

This function is available from bus node version 3.1.

The bus node helps you to quickly find and resolve typically errors that can occur during installation of a Cube system.

The bus node compares your planned configuration with the modules detected after the voltage supply is enabled.

Three different sources of error are identified and signalled both via the ProfiBus diagnostic and the LED displays of the bus node.

Cause	Signal
Less modules are installed than projected.	CfgErr LED = red
More modules are installed than projected.	CfgErr LED = red
A module was found that does not match the module configured for this slot.	CfgErr LED = red Us LED flashing on the segment where the deviation was found.

The first error location is always reported. This way, it is avoided that possible subsequent errors are also reported. Multiple errors in the configuration require several steps for troubleshooting.

If several identical modules are installed one after another, the last module will be indicated as error location. Observing the following rules you can easily find the error location.

① :Always check the installation starting at the reported error location from module to module in backwards direction, until you will find a deviation between the installed and the projected module.

② : After troubleshooting activate a power reset of the Cube system. If a new configuration error is found, proceed again according to rule 1.

5.7.2 ProfiBus-Diagnostic

In Byte 7 of the ProfiBus diagnostic you will find the detected cause of error:

Byte 7 Bus node

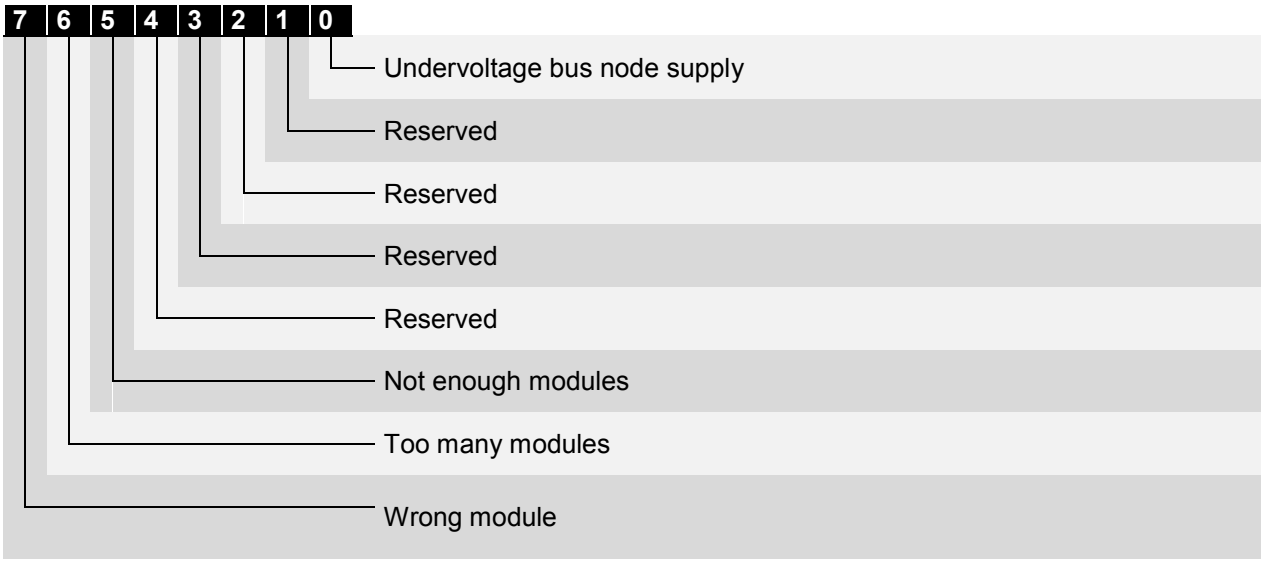


Fig. 53: Byte 7

Not enough modules	There are fewer modules in the system than determined in the configuration.
Too many modules	There are more modules in the system than determined in the configuration.
Wrong module	A wrong module was found in the configuration (part no.)

If a wrong module was found, the corresponding port is additionally reported via the station-related module diagnostic (Byte 10 to 25). Bit 7 (“communication error”) is set in the byte allocated to this slot.

Bytes 10 to 25 Module (port) 0 to 15

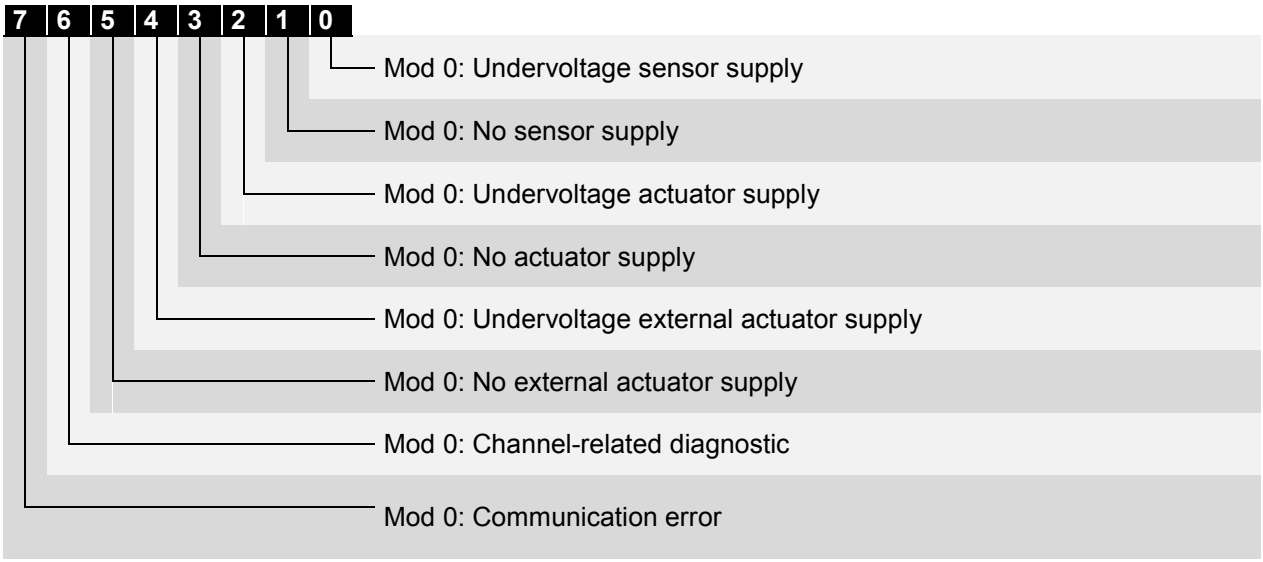

7 6 5 4 3 2 1 0
Mod 0: Undervoltage sensor supply
Mod 0: No sensor supply
Mod 0: Undervoltage actuator supply
Mod 0: No actuator supply
Mod 0: Undervoltage external actuator supply
Mod 0: No external actuator supply
Mod 0: Channel-related diagnostic
Mod 0: Communication error

Fig. 54: Byte 10 to 25

5.7.3 Examples

- • wrong module installed

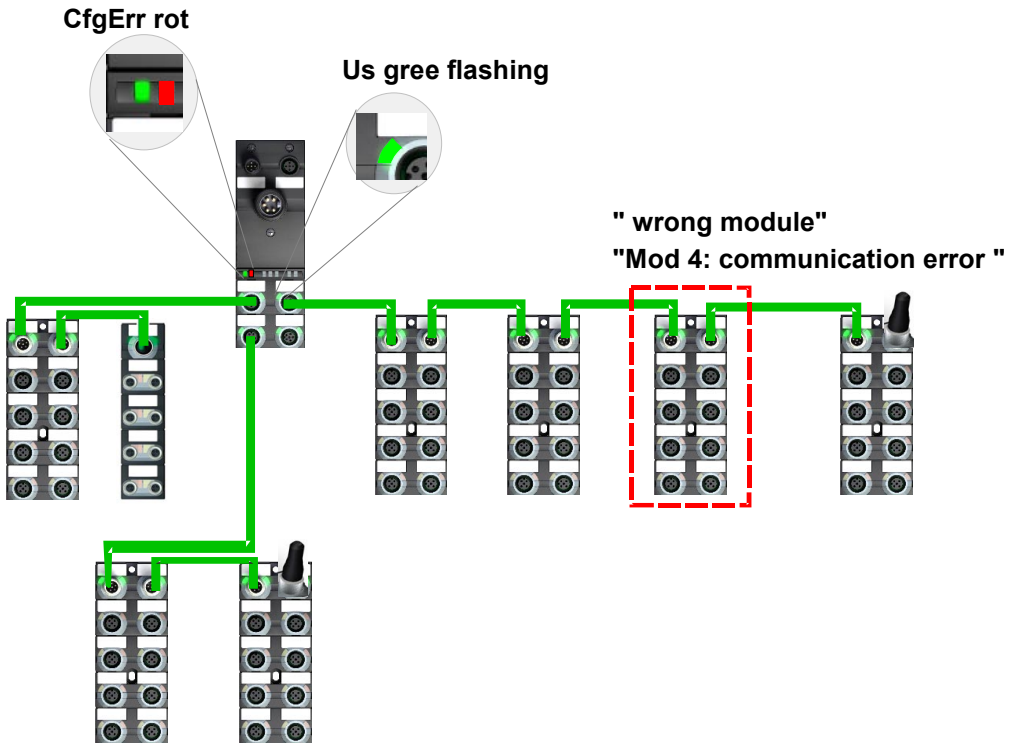


Fig. 55: Wrong module installed

- fewer modules installed than actually projected

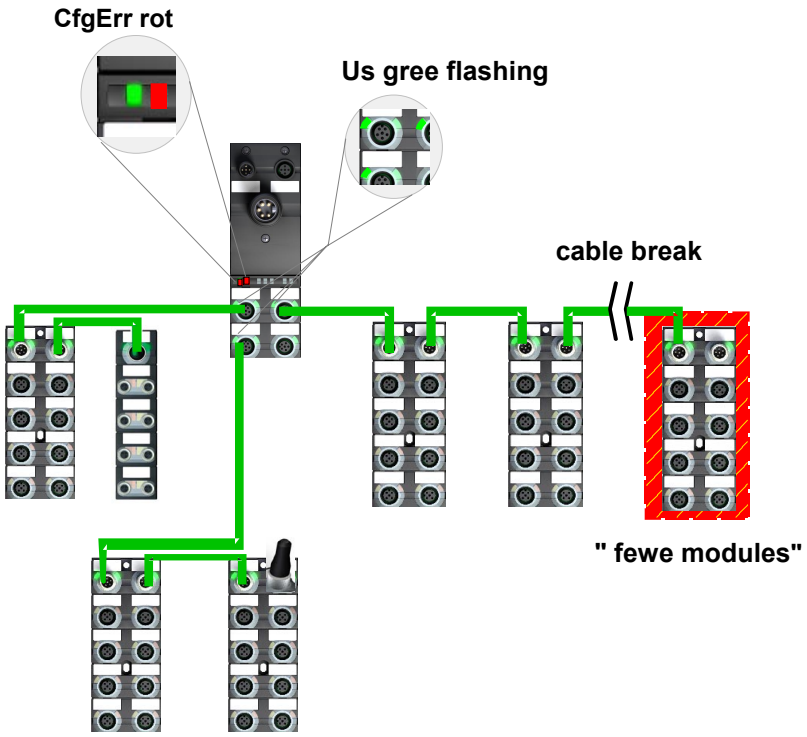


Fig. 56: fewer modules installed than actually projected

- more modules installed than projected

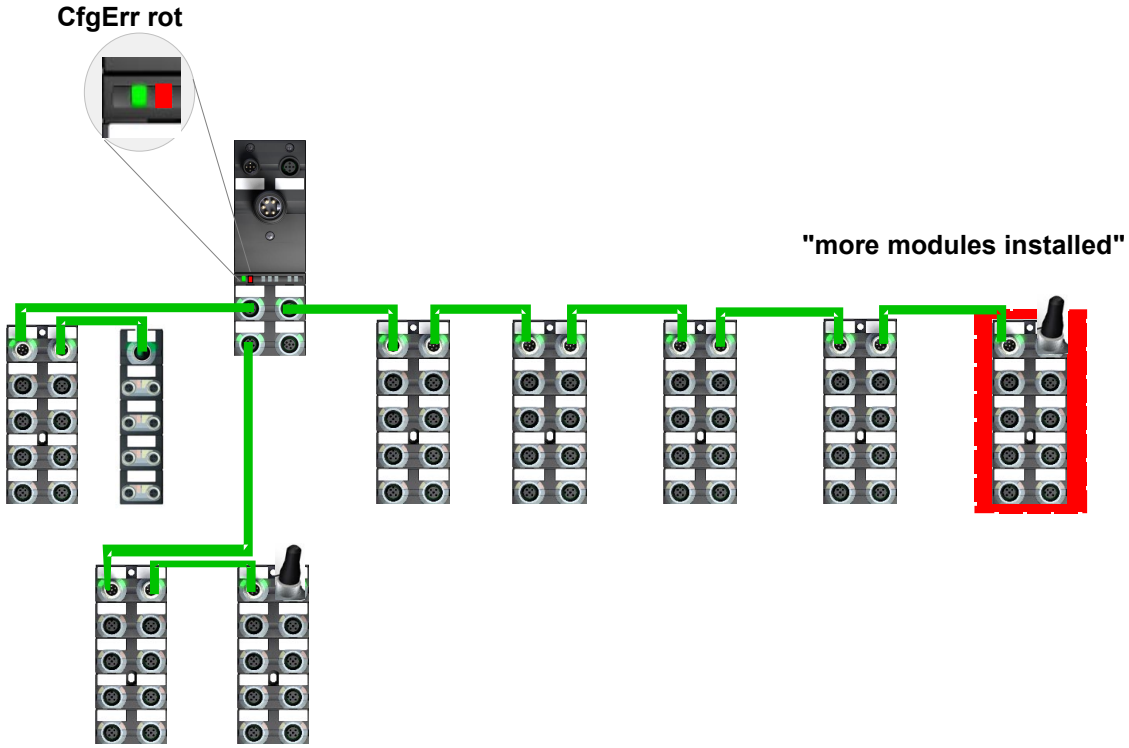


Fig. 57: More modules installed than projected

6. Module

6.1 Cube67 BN-P – Art.Nr. 56501

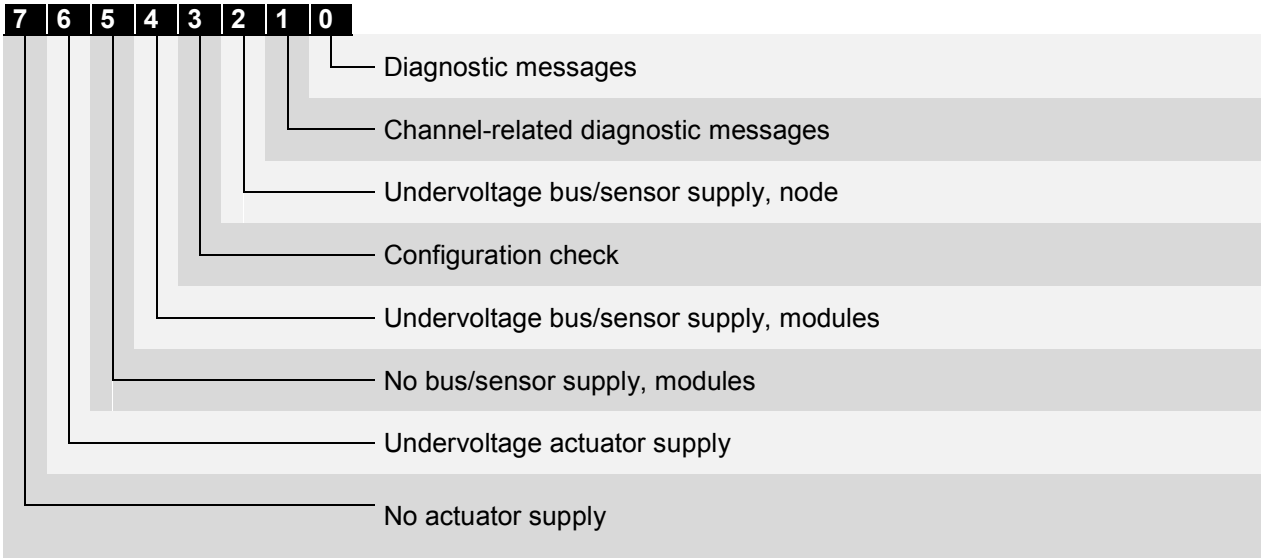
The bus node supports a maximum data length of 64 bytes of input data and 64 bytes of output data. The maximum supported parameter length of all modules amounts 196 bytes (see Parameter lengths of IO).

The first four user bytes contain parameter that are valid for the complete Cube67 system. Reserved bytes must always be written with zero.

Byte	Byte in message	Signification
0	7	Reserved
1	8	Reserved
2	9	Reserved
3	10	Global settings

Bytes 0 to 2 are reserved bytes

Byte 3 Globale settings



Diagnostic messages	Signification
Enable global diagnostics	Diagnostic messages are reported.
Disable global diagnostics	Diagnostic messages are not reported

Channel-related diagnostic messages	Signification
Enable channel diagnostics	Channel-related diagnostic messages are reported.
Disable channel diagnostics	Channel-related diagnostic messages are not reported.

Undervoltage bus/sensor supply node	Signification
Report	Undervoltage (< 18 V) of the bus node is reported.
Do not report	Undervoltage (< 18 V) of the bus node is not reported.

Configuration check	Signification
Standard	Start only when planned and actual configuration are identical.
Extended	Start via the machine option service.

Undervoltage bus/sensor supply modules	Signification
Report	Undervoltage (< 18V) sensor supply is reported.
Do not report	Undervoltage (< 18V) sensor supply is not reported.

No bus/sensor supply modules	Signification
Report	No supply (< 12 V) of the sensors is reported.
Do not report	No supply (< 12 V) of the sensors is not reported.

Undervoltage actuator supply	Signification
Report	Undervoltage (< 18 V) actuator supply is reported.
Do not report	Undervoltage (< 18 V) actuator supply is not reported.

No actuator supply	Signification
Report	No supply (< 12 V) of the actuators is reported.
Do not report	No supply (< 12 V) of the actuators is not reported.

6.2 Cube67 BN-P – Art.Nr. 56531

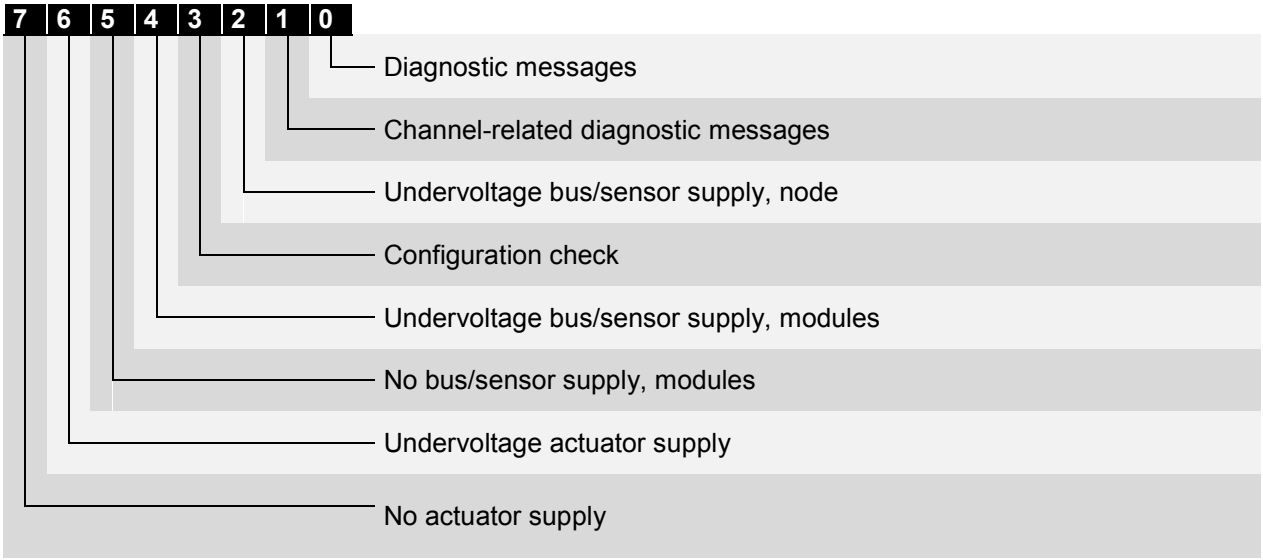
The bus node supports a maximum data length of 64 bytes of input data and 64 bytes of output data. The maximum supported parameter length of all modules amounts 196 bytes (see Parameter lengths of IO).

The first four user bytes contain parameter that are valid for the complete Cube67 system. Reserved bytes must always be written with zero.

Byte	Byte in message	Signification
0	7	Reserved
1	8	Reserved
2	9	Reserved
3	10	Global settings

Byte 0 to 2 reserved

Byte 3 global settings



Diagnostic messages	Signification
Enable global diagnostics	Diagnostic messages are reported.
Disable global diagnostics	No diagnostic messages are reported.

Channel-related diagnostic messages	Signification
Enable channel diagnostics	Channel-related diagnostic messages are reported.
Disable channel diagnostics	Channel-related diagnostic messages are not reported.

Undervoltage Bus/sensor supply node	Signification
Report	Undervoltage (< 18 V) of the bus node is reported.
Do not report	Undervoltage (< 18 V) of the bus node is not reported.

Configuration check	Signification
Standard	Start only when planned and actual configuration are identical.
Extended	Start via the machine option service.

Undervoltage Bus/sensor supply modules	Signification
Report	Undervoltage (< 18V) sensor supply is reported.
Do not report	Undervoltage (< 18V) sensor supply is not reported.

No bus/sensor supply modules	Signification
Report	No supply (< 12 V) of the sensors is reported.
Do not report	No supply (< 12 V) of the sensors is not reported.

Undervoltage actuator supply	Signification
Report	Undervoltage (< 18 V) actuator supply is reported.
Do not report	Undervoltage (< 18 V) actuator supply is not reported.

No actuator supply	Signification
Report	No supply (< 12 V) of the actuators is reported.
Do not report	No supply (< 12 V) of the actuators is not reported.

6.3 Cube20 Modules on Cube67 BN-P

For the Cube67 BN-P, the Cube20 modules described in this chapter can only be used via the module Cube20 BN67 DIO8 Art. No. 56450.

6.3.1 Cube20 BN67 DIO8 – Art. No. 56 450

6.3.1.1 Identification

Description	Art. No.	Process data		Identification
		Input	Output	
Cube20 BN67 DIO8	56450	1 byte	1 byte	$C2_{hex}$ 00_{hex} 00_{hex} DC_{hex} 82_{hex}

6.3.1.2 Bit assignment I/O - Data

6.3.1.2.1. Input Data IDM

Byte 0 (Terminal X3)					Byte 0 (Terminal X2)			
Bit	7	6	5	4	3	2	1	0
Channel	03	02	01	00	03	02	01	00

6.3.1.2.2. Output Data ODM

Byte 0 (Terminal X3)					Byte 0 (Terminal X2)			
Bit	7	6	5	4	3	2	1	0
Channel	03	02	01	00	03	02	01	00

6.3.1.3 Parameterization

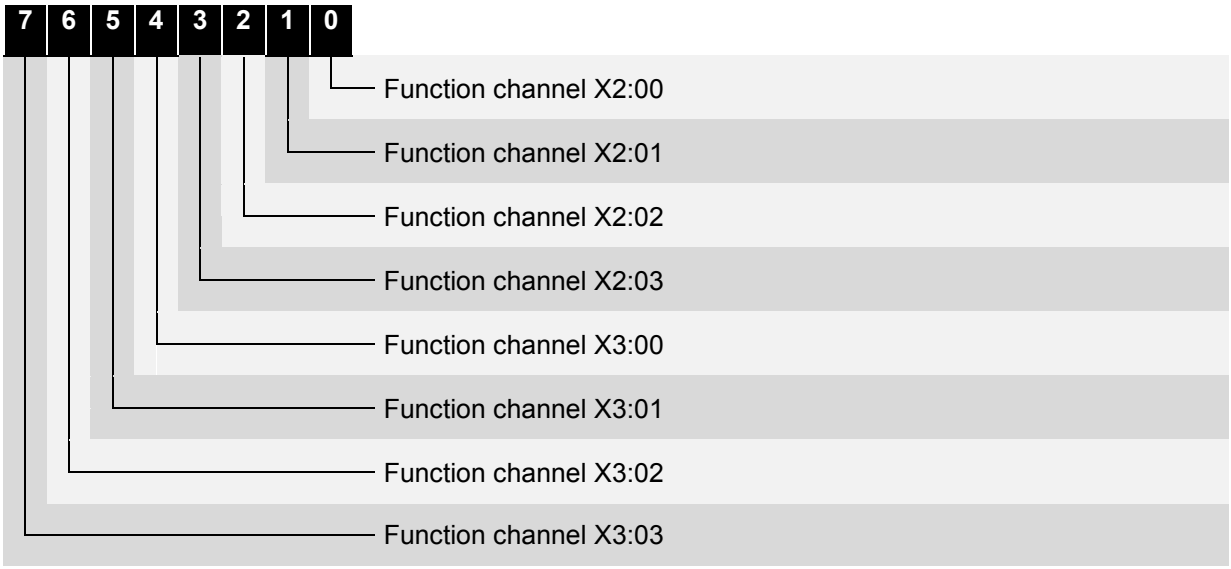
Length of the parameter: 1 Byte.

6.3.1.4 Function Channel X2 00…03 and X3 00…03

Decimal	Bit 0	Signification
0	0	NO input
1	1	Output

6.3.2 Bit Assignment of the Parameter Bytes

Byte 0: **Funktion Kanal X2 00…03 und X3 00…03**



6.3.3 Cube20 DI32 Art.-No.: 56112

6.3.3.1 Identification

Description	Art.	Process data		Identification
		Input	Output	
Cube20 DI32	56112	4 bytes	0 byte	0x42,0x03,0xDB,0x30

6.3.3.2 Number and Bit Assignment of Parameter Bytes

Number of Parameter bytes: 0

6.3.3.3 bit assignment I/O – Data – Input data IDM

Byte 0								
Bit	7	6	5	4	3	2	1	0
Terminal	X0 07	X0 06	X0 05	X0 04	X0 03	X0 02	X0 01	X0 00
Byte 1								
Bit	7	6	5	4	3	2	1	0
Terminal	X1 07	X1 06	X1 05	X1 04	X1 03	X1 02	X1 01	X1 00
Byte 2								
Bit	7	6	5	4	3	2	1	0
Terminal	X2 07	X2 06	X2 05	X2 04	X2 03	X2 02	X2 01	X2 00
Byte 3								
Bit	7	6	5	4	3	2	1	0
Terminal	X3 07	X3 06	X3 05	X3 04	X3 03	X3 02	X3 01	X3 00

6.3.4 Cube20 DO16 Art. No.: 56117

6.3.4.1 Identification

Description	Art.	Process data		Identification
		Input	Output	
Cube20 DO16	56117	0 bytes	4 bytes	0x82,0x01,0xDB,0x35

6.3.4.2 Number and Bit Assignment of Parameter Bytes

Number of Parameter bytes: 0

6.3.4.3 Bit assignment I/O – Data – Output Data ODM

	Byte 0							
Bit	7	6	5	4	3	2	1	0
terminal	X1 03	X1 02	X1 01	X1 00	X0 03	X0 02	X0 01	X0 00
	Byte 1							
Bit	7	6	5	4	3	2	1	0
terminal	X3 03	X3 02	X3 01	X3 00	X2 03	X2 02	X2 01	X2 00

6.3.5 Cube20 DO32 Art.-No.: 56118

6.3.5.1 Identification

Description	Art.	Process data		Identification
		Input	Output	
Cube20 DO32	56118	0 byte	4 bytes	0x82,0x03,0xDB,0x36

6.3.5.2 Number and Bit Assignment of Parameter Bytes

Number of Parameter bytes: 0

6.3.5.3 Bit assignment I/O – Data – Output Data ODM

Byte 0								
Bit	7	6	5	4	3	2	1	0
Terminal	X0 07	X0 06	X0 05	X0 04	X0 03	X0 02	X0 01	X0 00
Byte 1								
Bit	7	6	5	4	3	2	1	0
Terminal	X1 07	X1 06	X1 05	X1 04	X1 03	X1 02	X1 01	X1 00
Byte 2								
Bit	7	6	5	4	3	2	1	0
Terminal	X2 07	X2 06	X2 05	X2 04	X2 03	X2 02	X2 01	X2 00
Byte 3								
Bit	7	6	5	4	3	2	1	0
Terminal	X3 07	X3 06	X3 05	X3 04	X3 03	X3 02	X3 01	X3 00

6.3.6 Cube20 DI16 DO16 Art.-No.: 56168

Identification

Description	**Art.**	**Process data**		**Identification**
		Input	**Output**	
Cube20 DI16 DO16	56168	2 bytes	2 bytes	0xC2,0x01,0x01,0xDB,0x68

6.3.6.1 Number and Bit Assignment of Parameter Bytes

Number of Parameter bytes: 0

6.3.6.2 Bit assignment I/O - Data

Bit assignment I/O – Data – Input data IDM

Byte 0								
Bit	7	6	5	4	3	2	1	0
Terminal	X2 07	X2 06	X2 05	X2 04	X2 03	X2 02	X2 01	X2 00
Byte 1								
Bit	7	6	5	4	3	2	1	0
Terminal	X3 07	X3 06	X3 05	X3 04	X3 03	X3 02	X3 01	X3 00

Table 5-17: Input data Cube20 DI16 DO16 Art.-No.: 56168

Bit assignment I/O – Data – Output Data ODM

Byte 0								
Bit	7	6	5	4	3	2	1	0
Terminal	X0 07	X0 06	X0 05	X0 04	X0 03	X0 02	X0 01	X0 00
Byte 1								
Bit	7	6	5	4	3	2	1	0
Terminal	X1 07	X1 06	X1 05	X1 04	X1 03	X1 02	X1 01	X1 00

6.3.7 Cube20 AI4 U/I Art.-No.: 56200 / 56201

6.3.7.1 Identification of Cube20 AI4 U/I Art.-No. 56200

Description	Art. No.	Process data		Identification
		Input	Output	
Cube20 AI4 U/I	56201	4 words	0 words	0x42,0x43,0xDB,0x88

6.3.7.2 Number and Bit Assignment of Parameter Bytes Cube20 AI4 U/I Art. No.: 56200

Number of Parameter bytes: 12

Bit assignment of parameter bytes 0 (channel 0), 3 (channel 1), 6 (channel 2), 9 (channel 3)

Byte

7	6	5	4	3	2	1	0

Channel 0…3: measuring range, diagnostics, data format, smoothing

Measuring range channel 0…3

0 0 0 = Inactive
0 0 1 = 0..10V
0 1 0 = +/-10V
0 1 1 = 4..20 mA
1 0 0 = 0..20 mA

Diagnostic

0 = Report
1 = Do not report

Data format

0 = Byte sequence High/Low (Motorola)
1 = Byte sequence Low/High (Intel)

Smoothing

0 0 = None
0 1 = Weak
1 0 = Moderate
1 1 = Strong

reserviert

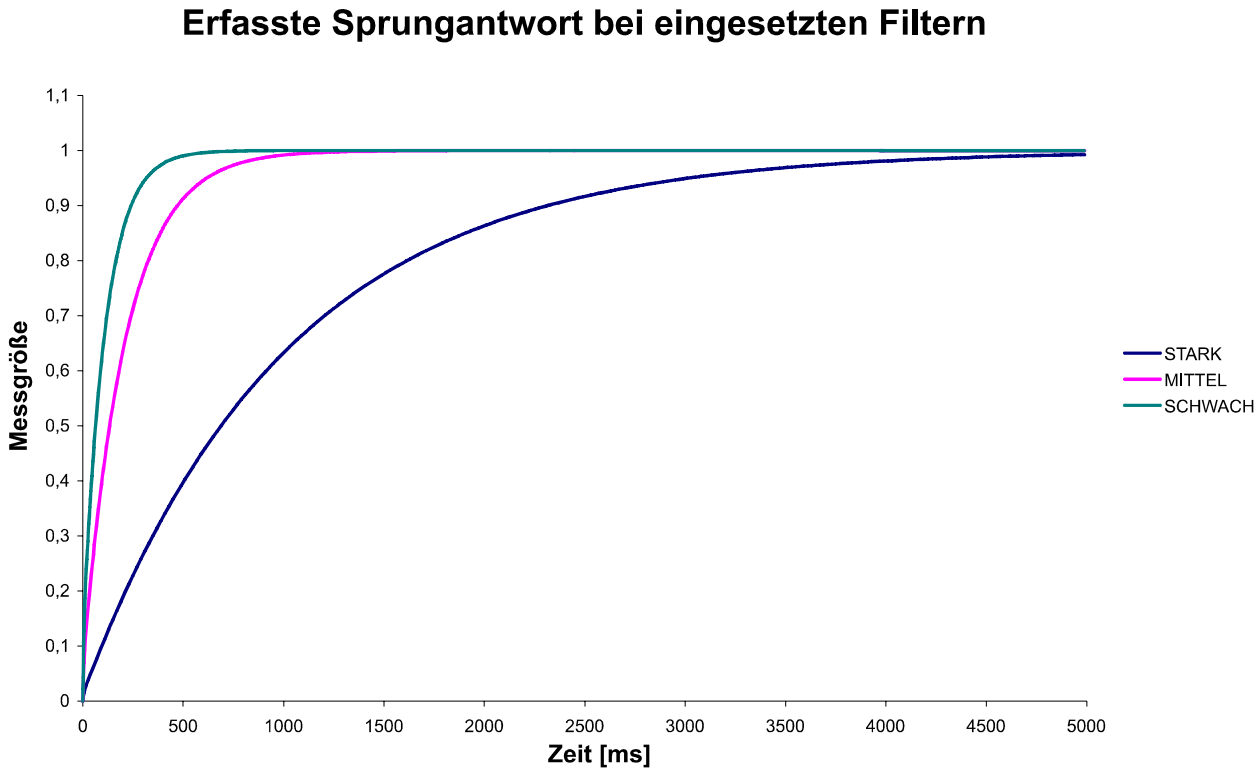
Bit assignment of parameter bytes 1…2, 4…5, 7…8, 10…11

Reserved

6.3.7.2.1. Explanation of Smoothing (Only Cube20 AI4 U/I Modules)

The analog signal can be prefiltered in the device, in order to reduce sensitivity to short-term jitter.

The measuring time per channel is 4.0 ms. The total cycle time is the result of the measuring time per channel + 4.0 ms. The diagram below illustrates the module behavior to a step response in an active channel.



6.3.7.3 Identification of Cube20 AI4 U/I Art.-No. 56201

Description	Art. No.	Process data		Identification
		Input	Output	
Cube20 AI4 U/I	56201	4 words	0 words	0x42,0x43,0xDB,0x89

6.3.7.4 Number and Bit Assignment of Parameter Bytes Cube20 AI4 U/I Art. No.: 56201

Number of Parameter bytes: 16

Bit assignment of parameter bytes 0 (channel 0), 4 (channel 1), 8 (channel 2), 12 (channel 3)

Byte

Channel 0…3: measuring range, diagnostics, data format, smoothing

7	6	5	4	3	2	1	0

Measuring range channel 0…3

0 0 0 = Inactive
0 0 1 = 0..10V
0 1 0 = +/-10V
0 1 1 = 4..20 mA
1 0 0 = 0..20 mA

Diagnostic

0 = Report
1 = Do not report

Data format

0 = Byte sequence High/Low (Motorola)
1 = Byte sequence Low/High (Intel)

Smoothing

0 0 = None
0 1 = Weak
1 0 = Moderate
1 1 = Strong

reserved

Bit assignment of parameter bytes 1, 5, 9, 13

reserved

For explanation of smoothing please see "Cube20 AI4 U/I Art.-No.: 56200".

Bit assignment of parameter bytes 2 and 3 (channel 0), 6 and 7 (channel 1), 10 and 11 (channel 2), 14 and 15 (channel 3)

Byte 2, 6, 10, 14 channel 0…3: Delta low Byte

Byte 3, 7, 11, 15 channel 0…3: Delta high Byte

Decimal	Byte	Signification
0 – 32767	0 – 0x7FFF	Delta

6.3.7.4.1. Delta Value (Only Cube20 AI4 U/I Art.-No.: 56201)

The delta value can be used to define the number of increments to increase or reduce the last measured value, in order to update the analog input value. This parameter can be used for reducing the bus load of the internal system connection.

Example: The last value measured was 1000. With a delta of 100, the next measurand will only be sent, if it is < 900 or > 1100.

6.3.7.5 Binary Representation of the Analog Data of Cube20 AI4 U/I Art.-No.: 56200 / 56201

Bit assignment of I/O – data in Intel format

I/O data								
Byte	7	6	5	4	3	2	1	0
Channel	3		2		1		0	

Bit	MSB							LSB	MSB							LSB
	7	6	5	4	3	2	1	0	15	14	13	12	11	10	9	8
Byte	LOWBYTE								VZ	HIGHBYTE						
	7								6							

Bit assignment of I/O – data in Motorola format

I/O data								
Byte	7	6	5	4	3	2	1	0
Channel	3		2		1		0	

Bit	MSB							LSB	MSB							LSB
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Byte	VZ	HIGHBYTE							LOWBYTE							
	7								6							

6.3.7.6 Representation of analog values of Cube20 AI4 U/I Art.-No.: 56200 / 56201

Representation of analog values of input data 16 Bit with sign

Measuring range	Measuring value			Range	Diagnostic
0...10 V	decimal	hexadecimal	binary		
> 11.7589 V	32767	7FFF	0111 1111 1111 1111	Overshooting	Yes
11.7589 V	32511	7EFF	0111 1110 1111 1111	Overshooting	Yes
⋮	⋮	⋮	⋮	Overshooting	From threshold value
10.0004 V	27649	6C01	0110 1100 0000 0001	Overshooting	No
10 V	27648	6C00	0110 1100 0000 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
5 V	13824	3600	0011 0110 0000 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
0.0004 V	1	0001	0000 0000 0000 0001	Nominal range	No
0	0	0000	0000 0000 0000 0000	Nominal range	No
< 0	0	0000	0000 0000 0000 0000	Undershooting	From threshold value

Measuring range	Measuring value			Range	Diagnostic
-10...+10 V	decimal	hexadecimal	binary		
> 11.7589 V	32767	7FFF	0111 1111 1111 1111	Overshooting	Yes
11.7589 V	32511	7EFF	0111 1110 1111 1111	Overshooting	Yes
⋮	⋮	⋮	⋮	Overshooting	From threshold value
10.0004 V	27649	6C01	0110 1100 0000 0001	Overshooting	No
10 V	27648	6C00	0110 1100 0000 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
5 V	13824	3600	0011 0110 0000 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
0.0004 V	1	0001	0000 0000 0000 0001	Nominal range	No
0	0	0000	0000 0000 0000 0000	Nominal range	No
-0.0004 V	-1	FFFF	1111 1111 1111 1111	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
-5 V	-13824	CA00	1100 1010 0000 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
-10 V	-27648	9400	1001 0100 0000 0000	Nominal range	No
-10.0004 V	-27649	93FF	1001 0011 1111 1111	Undershooting	No
⋮	⋮	⋮	⋮	Undershooting	From threshold value
-11.759 V	-32512	8100	1000 0001 0000 0000	Undershooting	Yes
< -11.759 V	-32768	8000	1000 0000 0000 0000	Undershooting	Yes

Measuring range	Measuring value			Range	Diagnostic
< 0...20 mA	decimal	hexadecimal	decimal		
> 22.963 mA	32767	7FFF	0111 1111 1111 1111	Overshooting	Yes
22.963 mA	31744	7C00	0111 1110 1111 1111	Overshooting	Yes
⋮	⋮	⋮	⋮	Overshooting	From threshold value
20.0007 mA	27649	6C01	0110 1100 0000 0001	Overshooting	No
20 mA	27648	6C00	0110 1100 0000 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
10 mA	13824	3600	0011 0110 0000 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
0.0007 mA	1	0001	0000 0000 0000 0001	Nominal range	No
0	0	0000	0000 0000 0000 0000	Nominal range	No
< 0	0	0000	0000 0000 0000 0000	Undershooting	No

Measuring range	Measuring value			Range	Diagnostic
< 4...20 mA	decimal	hexadecimal	binary		
> 22.8142 mA	32767	7FFF	0111 1111 1111 1111	Overshooting	Yes
22.8142 mA	32511	7EFF	0111 1100 0000 0000	Overshooting	Yes
⋮	⋮	⋮	⋮	Overshooting	From threshold value
20.0006 mA	27649	6C01	0110 1100 0000 0001	Overshooting	No
20 mA	27648	6C00	0110 1100 0000 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
12 mA	13824	3600	0011 0110 0000 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
4.0006 mA	1	0001	0000 0000 0000 0001	Nominal range	No
4 mA	0	0000	0000 0000 0000 0000	Nominal range	No
< 4 mA	0	0000	0000 0000 0000 0000	Undershooting	From threshold value

6.3.8 Cube20 AO4 U/I Art.-No.: 56220 / 56221

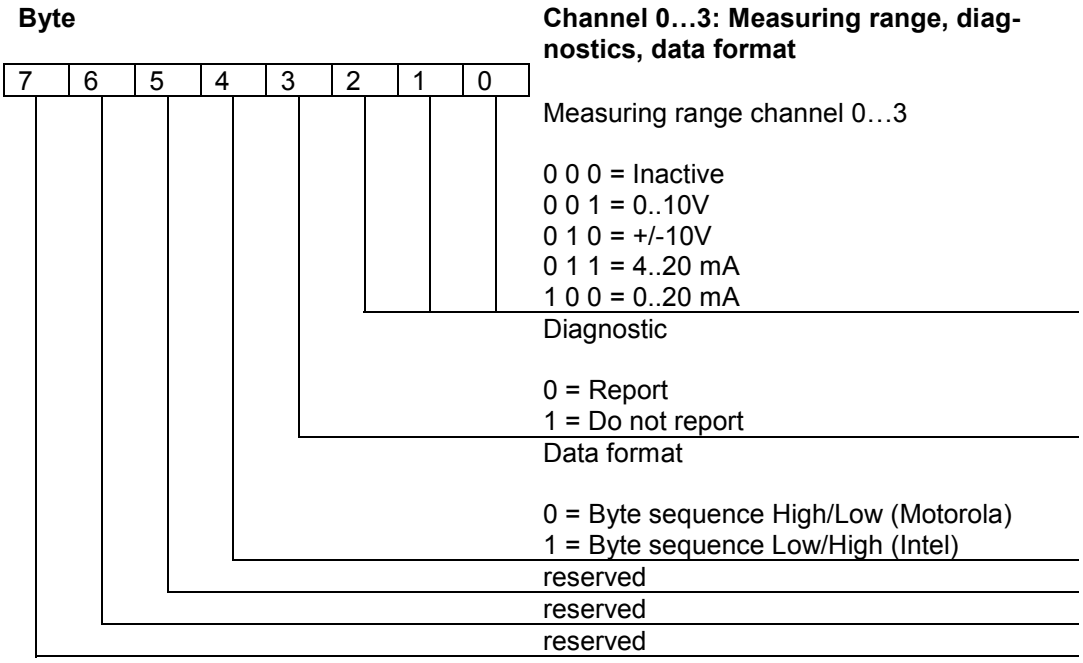
6.3.8.1 Identification of Cube20 AO4 U/I Art.-No. 56220

Description	Art. No.	Process data		Identification
		Input	Output	
Cube20 AO4 U/I	56220	0 words	4 words	0x82,0x43,0xDB,0x9C

6.3.8.2 Number and Bit Assignment of Parameter Bytes Cube20 AO4 U/I Art. No.: 56220

Number of Parameter bytes: 12

Bit assignment of parameter bytes 0 (channel 0), 3 (channel 1), 6 (channel 2), 9 (channel 3)


Byte
Channel 0…3: Measuring range, diag-nostics, data format
7 6 5 4 3 2 1 0
Measuring range channel 0…3
0 0 0 = Inactive
0 0 1 = 0..10V
0 1 0 = +/-10V
0 1 1 = 4..20 mA
1 0 0 = 0..20 mA
Diagnostic
0 = Report
1 = Do not report
Data format
0 = Byte sequence High/Low (Motorola)
1 = Byte sequence Low/High (Intel)
reserved
reserved
reserved

Bit assignment of parameter bytes 1…2, 4…5, 7…8, 10…11

Reserved

6.3.8.3 Identification of Cube20 AO4 U/I Art.-No. 56221

Description	Art. No.	Process data		Identification
		Input	Output	
Cube20 AO4 U/I	56221	0 words	4 words	0x82,0x43,0xDB,0x9D

6.3.8.4 Number and Bit Assignment of Parameter Bytes Cube20 AO4 U/I Art. No.: 56221

Number of Parameter bytes: 16

Bit assignment of parameter bytes 0 (channel 0), 4 (channel 1), 8 (channel 2), 12 (channel 3)

Byte	**Channel 0…3: Measuring range, diagnostics, data format**
7 6 5 4 3 2 1 0	
2 1 0	Measuring range channel 0…3 0 0 0 = Inactive 0 0 1 = 0..10V 0 1 0 = +/-10V 0 1 1 = 4..20 mA 1 0 0 = 0..20 mA
3	Diagnostic 0 = Report 1 = Do not report
4	Data format 0 = Byte sequence High/Low (Motorola) 1 = Byte sequence Low/High (Intel)
7 6 5	reserved

Bit assignment of parameter bytes 1…3, 5…7, 9…11, 13…15,

Reserved

6.3.8.5 Binary Representation of the Analog Data of Cube20 AO4 U/I Art.-No.: 56220 / 56221

Bit assignment of I/O – data in Intel format

I/O data								
Byte	7	6	5	4	3	2	1	0
Channel	3		2		1		0	

Bit	MSB							LSB	MSB							LSB
	7	6	5	4	3	2	1	0	15	14	13	12	11	10	9	8
Byte	LOWBYTE								VZ	HIGHBYTE						
	7								6							

Bit assignment of I/O – data in Motorola format

I/O data								
Byte	7	6	5	4	3	2	1	0
Channel	3		2		1		0	

Bit	MSB							LSB	MSB							LSB
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Byte	VZ	HIGHBYTE							LOWBYTE							
	7								6							

6.3.8.6 Representation of Analog Values of Cube20 AO4 U/I Art.-No.: 56220 / 56221

Representation of analog values of output data 16 Bit with sign

Output range	Measured value			Range	Diag-nostic
0...10 V	decimal	hexadecimal	binary		
10 V	>= 27649	>= 6C01	>= 0110 1100 0000 0001	Overshooting	No
10 V	27648	6C00	0110 1100 0000 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
5 V	13824	3600	0011 0110 0000 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
0.0004 V	1	0001	0000 0000 0000 0001	Nominal range	No
0	0	0000	0000 0000 0000 0000	Nominal range	No
0	< 0	<0000	< 0000 0000 0000 0000	Undershooting	No

Measuring range	Measured value			Range	Diag-nostic
-10...+10 V	decimal	hexadecimal	binary		
10 V	>= 27649	>= 6C01	>= 0110 1100 0000 0001	Overshooting	No
10 V	27648	6C00	0110 1100 0000 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
5 V	13824	3600	0011 0110 0000 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
0.0004 V	1	0001	0000 0000 0000 0001	Nominal range	No
0	0	0000	0000 0000 0000 0000	Nominal range	No
-0.0004 V	-1	FFFF	1111 1111 1111 1111	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
-5 V	-13824	CA00	1100 1010 0000 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
-10 V	-27648	9400	1001 0100 0000 0000	Nominal range	No
-10 V	<= -27649	<= 93FF	<= 1001 0011 1111 1111	Undershooting	No

Measuring range	Measured value			Range	Diag-nostic
0...20 mA	decimal	hexadecimal	binary		
20 mA	>= 27649	>= 6C01	>= 0110 1100 0000 0001	Overshooting	No
20 mA	27648	6C00	0110 1100 0000 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
10 mA	13824	3600	0011 0110 0000 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
0.0007 mA	1	0001	0000 0000 0000 0001	Nominal range	No
0	0	0000	0000 0000 0000 0000	Nominal range	No

Measuring range	Measured value			Range	Diag-nostic
4...20 mA	decimal	hexadecimal	binary		
20 mA	>= 27649	>= 6C01	>= 0110 1100 0000 0001	Overshooting	No
20 mA	27648	6C00	0110 1100 0000 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
12 mA	13824	3600	0011 0110 0000 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
4.0006 mA	1	0001	0000 0000 0000 0001	Nominal range	No
4 mA	0	0000	0000 0000 0000 0000	Nominal range	No

6.3.9 Cube20 AI4 RTD Art.-No.: 56230

6.3.9.1 Identification

Description	Art. No.	Process data		Identification
		Input	Output	
Cube20 AI4 RTD	56230	4 words	0 words	0x42,0x43,0xDB,0xA6

6.3.9.2 Number and Bit Assignment of Parameter Bytes

Number of Parameter bytes: 5

Bit assignment of parameter byte 0

Byte 0

7	6	5	4	3	2	1	0

Channel 0: data format, temperature unit, channel diagnostics

Data format

0 = Byte sequence High/Low (Motorola)
1 = Byte sequence Low/High (Intel)

Temperature unit

0 = Celcius
1 = Fahrenheit

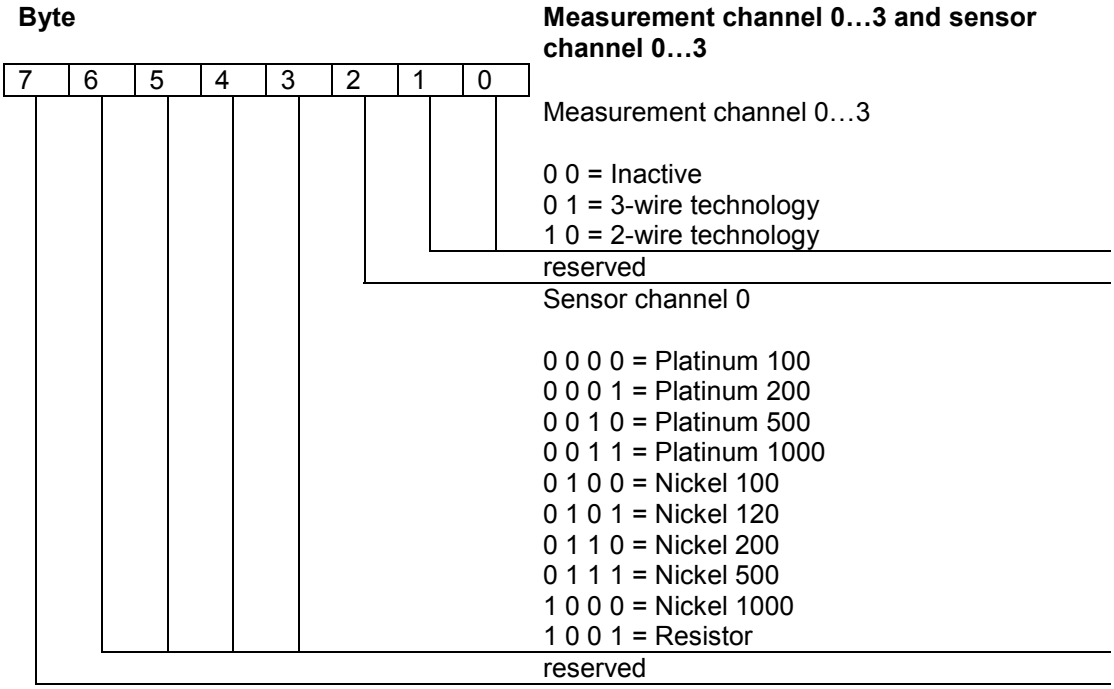
reserved

Channel diagnostic

0 = Report
1 = Do not report

reserved

Bit assignment of parameter bytes 1 (channel 0), 2 (channel 1), 3 (channel 2), 4 (channel 3)


Byte
Measurement channel 0…3 and sensor channel 0…3
7 6 5 4 3 2 1 0
Measurement channel 0…3
0 0 = Inactive
0 1 = 3-wire technology
1 0 = 2-wire technology
reserved
Sensor channel 0
0 0 0 0 = Platinum 100
0 0 0 1 = Platinum 200
0 0 1 0 = Platinum 500
0 0 1 1 = Platinum 1000
0 1 0 0 = Nickel 100
0 1 0 1 = Nickel 120
0 1 1 0 = Nickel 200
0 1 1 1 = Nickel 500
1 0 0 0 = Nickel 1000
1 0 0 1 = Resistor
reserved

6.3.9.3 Binary Representation of Analog Data

Bit assignment of I/O – data in Intel format

I/O data								
Byte	7	6	5	4	3	2	1	0
Channel	3		2		1		0	

Bit	MSB							LSB	MSB							LSB
	7	6	5	4	3	2	1	0	15	14	13	12	11	10	9	8
Byte	LOWBYTE								VZ	HIGHBYTE						
	7								6							

Bit assignment of I/O – data in Motorola format

I/O data								
Byte	7	6	5	4	3	2	1	0
Channel	3		2		1		0	

Bit	MSB							LSB	MSB							LSB
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Byte	VZ	HIGHBYTE							LOWBYTE							
	7								6							

6.3.9.4 Representation of Analog Values of Cube20 AI4 RTD Art.-No.: 56230

Representation of analog values of input data 16 Bit with sign

The data is represented in steps of 1/10 Ohm for the resistance range, in steps of 1/10 degree Celsius or 1/10 degree Fahrenheit for the temperature ranges.

Analog values for the unit "degree Celsius"

Measuring range	Measuring value			Range	Diagnostic
Pt 100 / Pt 200 / Pt 500 / Pt 1000	decimal	hexadecimal	binary		
> 850 °C	8500	2134	0010 0001 0011 0100	Overshooting	From threshold value
850 °C	8500	2134	0010 0001 0011 0100	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
0.1 °C	0	0001	0000 0000 0000 0001	Nominal range	No
0 °C	0	0000	0000 0000 0000 0000	Nominal range	No
-0.1 °C	-1	FFFF	1111 1111 1111 1111	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
-200 °C	-2000	F830	1111 1000 0011 0000	Nominal range	No
< -200 °C	-2000	F830	1111 1000 0011 0000	Undershooting	From threshold value

Measuring range	Measured value			Range	Diagnostic
Ni 100 / Ni 120 / Ni 200 / Ni 500 / Ni 1000	decimal	hexadecimal	binary		
> 250 °C	2500	09C4	0000 1001 1100 0100	Overshooting	From threshold value
250 °C	2500	09C4	0000 1001 1100 0100	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
0.1 °C	0	0000	0000 0000 0000 0001	Nominal range	No
0 °C	0	0000	0000 0000 0000 0000	Nominal range	No
-0.1 °C	-1	FFFF	1111 1111 1111 1111	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
-60 °C	-600	FDA8	1111 1101 1010 1000	Nominal range	No
< -60 °C	-600	FDA8	1111 1101 1010 1000	Undershooting	From threshold value

Analog values for the unit "degree Fahrenheit"

Measuring range	Measured value			Range	Diagnostic
Pt 100 / Pt 200 / Pt 500 / Pt 1000	decimal	hexadecimal	binary		
> 1562 °F	15620	3D04	0011 1101 0000 0100	Overshooting	From threshold value
1562 °F	15620	3D04	0011 1101 0000 0100	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
0.1 °F	1	0001	0000 0000 0000 0001	Nominal range	No
0 °F	0	0000	0000 0000 0000 0000	Nominal range	No
-0.1 °F	-1	FFFF	1111 1111 1111 1111	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
-328 °F	-3280	F330	1111 0011 0011 0000	Nominal range	No
< -328 °F	-3280	F330	1111 0011 0011 0000	Undershooting	From threshold value

Measuring range	Measured value			Range	Diagnostic
Ni 100 / Ni 120 / Ni 200 / Ni 500 / Ni 1000	decimal	hexadecimal	binary		
> 482 °F	4820	12D4	0001 0010 1101 0100	Overshooting	From threshold value
482 °F	4820	12D4	0001 0010 1101 0100	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
0.1 °F	1	0001	0000 0000 0000 0001	Nominal range	No
0 °F	0	0000	0000 0000 0000 0000	Nominal range	No
-0.1 °F	-1	FFFF	1111 1111 1111 1111	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
-76 °F	-760	FD08	1111 1101 0000 1000	Nominal range	No
< -76 °F	-760	FD08	1111 1101 0000 1000	Undershooting	From threshold value

Measuring range	Measured value			Range	Diagnostic
Resistor	decimal	hexadecimal	binary		
> 3000 □	30000	7530	0111 0101 0011 0000	Overshooting	From threshold value
3000 □	30000	7530	0111 0101 0011 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
0,1 □	1	0001	0000 0000 0000 0001	Nominal range	No
0	0	0000	0000 0000 0000 0000	Nominal range	No

6.3.10 Cube20 AI4 TH Art.-No.: 56240

6.3.10.1 Identification

Description	Art. No.	Process data		Identification
		Input	Output	
Cube20 AI4 TH	56240	4 words	0 words	0x42,0x43,0xDB,0xB0

6.3.10.2 Number and Bit Assignment of Parameter Bytes

Number of Parameter bytes: 5

Bit assignment of parameter byte 0

Byte 0

7	6	5	4	3	2	1	0

Channel 0: data format, temperature unit, channel diagnostics

Data format

0 = Byte sequence High/Low (Motorola)
1 = Byte sequence Low/High (Intel)

Temperature unit

0 = Celcius
1 = Fahrenheit

reserved

Channel diagnostic

0 = Report
1 = Do not report

reserved

Bit assignment of parameter bytes 1 (channel 0), 2 (channel 1), 3 (channel 2), 4 (channel 3)

Byte								Channel 0…3:
7	6	5	4	3	2	1	0	
								Measurement channel 0 0 0 0 = Inactive 0 0 1 = Type K 0 1 0 = Type N 0 1 1 = Type J 1 0 0 = Type E 1 0 1 = Type R
								reserved

6.3.10.3 Binary Representation of Analog Data

Bit assignment of I/O – data in Intel format

	I/O data							
Byte	7	6	5	4	3	2	1	0
Channel	3		2		1		0	

Bit	MSB							LSB	MSB							LSB
	7	6	5	4	3	2	1	0	15	14	13	12	11	10	9	8
Byte	LOWBYTE								VZ	HIGHBYTE						
	7								6							

Bit assignment of I/O – data in Motorola format

	I/O data							
Byte	7	6	5	4	3	2	1	0
Channel	3		2		1		0	

Bit	MSB							LSB	MSB							LSB
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Byte	VZ	HIGHBYTE							LOWBYTE							
	7								6							

6.3.10.4 Representation of Analog Values of Cube20 AI4 TH, Art. No.: 56240

Representation of analog values of input data 16 Bit with sign

The data are represented in steps of 1/10 degree Celsius or 1/10 degree Fahrenheit.

Analog values for the unit "degree Celsius"

Measuring range	Measured value			Range	Diagnostic
Type K	decimal	hexadecimal	binary		
> 1372 °C	13720	3598	0011 0101 1001 1000	Overshooting	From threshold value
1372 °C	13720	3598	0011 0101 1001 1000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
0.1 °C	0	0001	0000 0000 0000 0001	Nominal range	No
0 °C	0	0000	0000 0000 0000 0000	Nominal range	No
-0.1 °C	-1	FFFF	1111 1111 1111 1111	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
-200 °C	-2000	F830	1111 1000 0011 0000	Nominal range	No
< -200 °C	-2000	F830	1111 1000 0011 0000	Undershooting	From threshold value

Measuring range	Measured value			Range	Diagnostic
Type N	decimal	hexadecimal	binary		
> 1300 °C	13000	32C8	0011 0010 1100 1000	Overshooting	From threshold value
1300 °C	13000	32C8	0011 0010 1100 1000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
0.1 °C	0	0001	0000 0000 0000 0001	Nominal range	No
0 °C	0	0000	0000 0000 0000 0000	Nominal range	No
-0.1 °C	-1	FFFF	1111 1111 1111 1111	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
-200 °C	-2000	F830	1111 1000 0011 0000	Nominal range	No
< -200 °C	-2000	F830	1111 1000 0011 0000	Undershooting	From threshold value

Measuring range	Measured value			Range	Diagnostic
Type J	decimal	hexadecimal	binary		
> 1200 °C	12000	2EE0	0010 1110 1110 0000	Overshooting	From threshold value
1200 °C	12000	2EE0	0010 1110 1110 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
0.1 °C	0	0001	0000 0000 0000 0001	Nominal range	No
0 °C	0	0000	0000 0000 0000 0000	Nominal range	No
-0.1 °C	-1	FFFF	1111 1111 1111 1111	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
-200 °C	-2000	F830	1111 1000 0011 0000	Nominal range	No
< -200 °C	-2000	F830	1111 1000 0011 0000	Undershooting	From threshold value

Measuring range	Measured value			Range	Diagnostic
Type E	decimal	hexadecimal	binary		
> 1000 °C	10000	2710	0010 0111 0001 0000	Overshooting	From threshold value
1000 °C	10000	2710	0010 0111 0001 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
0.1 °C	0	0001	0000 0000 0000 0001	Nominal range	No
0 °C	0	0000	0000 0000 0000 0000	Nominal range	No
-0.1 °C	-1	FFFF	1111 1111 1111 1111	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
-200 °C	-2000	F830	1111 1000 0011 0000	Nominal range	No
< -200 °C	-2000	F830	1111 1000 0011 0000	Undershooting	From threshold value

Measuring range	Measured value			Range	Diagnostic
Type R	decimal	hexadecimal	binary		
> 1768 °C	17680	4510	0100 0101 0001 0000	Overshooting	From threshold value
1768 °C	17680	4510	0100 0101 0001 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
0.1 °C	0	0001	0000 0000 0000 0001	Nominal range	No
0 °C	0	0000	0000 0000 0000 0000	Nominal range	No
-0.1 °C	-1	FFFF	1111 1111 1111 1111	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
-50 °C	-500	FE0C	1111 1110 0000 1100	Nominal range	No
< -50 °C	-500	FE0C	1111 1110 0000 1100	Undershooting	From threshold value

Analog values for the unit "degree Fahrenheit"

Measuring range	Measured value			Range	Diagnostic
Type K	decimal	hexadecimal	binary		
> 2501.6 °F	25016	61B8	0011 0000 11011 1000	Overshooting	From threshold value
2501.6 °F	25016	61B8	0011 0000 11011 1000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
0.1 °F	0	0001	0000 0000 0000 0001	Nominal range	No
0 °F	0	0000	0000 0000 0000 0000	Nominal range	No
-0.1 °F	-1	FFFF	1111 1111 1111 1111	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
-328 °F	-3280	F330	1111 0011 0011 0000	Nominal range	No
< -328 °F	-3280	F330	1111 0011 0011 0000	Undershooting	From threshold value

Measuring range	Measured value			Range	Diagnostic
Type N	decimal	hexadecimal	binary		
> 2372 °F	23720	5CA8	0101 1100 1010 1000	Overshooting	From threshold value
2372 °F	23720	5CA8	0101 1100 1010 1000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
0.1 °F	0	0001	0000 0000 0000 0001	Nominal range	No
0 °F	0	0000	0000 0000 0000 0000	Nominal range	No
-0.1 °F	-1	FFFF	1111 1111 1111 1111	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
-328 °F	-3280	F330	1111 0011 0011 0000	Nominal range	No
< -328 °F	-3280	F330	1111 0011 0011 0000	Undershooting	From threshold value

Measuring range	Measured value			Range	Diagnostic
Type J	decimal	hexadecimal	binary		
> 2192 °F	21920	55A0	0101 0101 1010 0000	Overshooting	From threshold value
2192 °F	21920	55A0	0101 0101 1010 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
0.1 °F	0	0001	0000 0000 0000 0001	Nominal range	No
0 °F	0	0000	0000 0000 0000 0000	Nominal range	No
-0.1 °F	-1	FFFF	1111 1111 1111 1111	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
-328 °F	-3280	F330	1111 0011 0011 0000	Nominal range	No
< -328 °F	-3280	F330	1111 0011 0011 0000	Undershooting	From threshold value

Measuring range	Measured value			Range	Diagnostic
Type E	decimal	hexadecimal	binary		
> 1832 °F	18320	4790	0100 0111 1001 0000	Overshooting	From threshold value
1832 °F	18320	4790	0100 0111 1001 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
0.1 °F	0	0001	0000 0000 0000 0001	Nominal range	No
0 °F	0	0000	0000 0000 0000 0000	Nominal range	No
-0.1 °F	-1	FFFF	1111 1111 1111 1111	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
-328 °F	-3280	F330	1111 0011 0011 0000	Nominal range	No
< -328 °F	-3280	F330	1111 0011 0011 0000	Undershooting	From threshold value

Measuring range	Measured value			Range	Diagnostic
Type R	decimal	hexadecimal	binary		
> 3214.4 °F	32144	7D90	0111 1101 1001 0000	Overshooting	From threshold value
3214.4 °F	32144	7D90	0111 1101 1001 0000	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
0.1 °F	0	0001	0000 0000 0000 0001	Nominal range	No
0 °F	0	0000	0000 0000 0000 0000	Nominal range	No
-0.1 °F	-1	FFFF	1111 1111 1111 1111	Nominal range	No
⋮	⋮	⋮	⋮	Nominal range	No
-58 °F	-580	FDBC	1111 1101 1011 1100	Nominal range	No
< -58 °F	-580	FDBC	1111 1101 1011 1100	Undershooting	From threshold value

6.4 Cube67 Digital I/O Modules

In the GSD file Version 1, the default setting of Pin 2 “Diagnostic input”. In the GSD file Version 2 the default setting was changed to “input with N/O function”.

Reserved bytes must be written with zero. When using the GSD, file this will be done automatically.

No. of I/O modules	Running time bus node	Running time module	Total running time
1	1-2	2-4	3 – 6 ms
4	1-4	2-4	3 – 8 ms
8	1-5	2-4	3 – 9 ms
12	2-6	2-4	4 – 10 ms
16	2-10	2-4	4 – 14 ms

6.4.1 DIO16 C 8xM12 – Art.Nr. 56600

6.4.1.1 Identification

Description	Art. No.	Process data		Identification
		Input	Output	
DIO 16 C 8xM12	56600	2 bytes	2 bytes	$C2_{hex}$ 01_{hex} 01_{hex} DD_{hex} 18_{hex}
DI16 C 8xM12	56600	2 bytes	-	42_{hex} 01_{hex} DD_{hex} $1A_{hex}$
DO16 C 8xM12	56600	-	2 bytes	82 $_{hex}$ 01_{hex} DD_{hex} $1C_{hex}$

6.4.1.2 Bit Assignment I/O - Data

Input Data (IDM)								
Byte 0 (Pin 4 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00
Byte 1 (Pin 2 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	17	16	15	14	13	12	11	10

Output data (ODM)								
Byte 0 (Pin 4 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00
Byte 1 (Pin 2 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	17	16	15	14	13	12	11	10

6.4.1.3 Parameterization

For several parameters, more than two options are possible. Each of these parameters is coded with two bits. Values from 0dez to 3dez are therefore possible. Please note that the coding of the functions fo Pin 2 and Pin 4 are not identical.

Function Pin 2

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	N/C input
2	1	0	Diagnostic input
3	1	1	Output

Function Pin 4

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Output
3	1	1	reserved

6.4.1.4 Parameter bytes

Byte	Signification
0	Function socket 0..3 Pin 4 (Channel 00..03)
1	Function socket 4..7 Pin 4 (Channel 04..07)
2	Function socket 0..3 Pin 2 (Channel 10..13)
3	Function socket 4..7 Pin 2 (Channel 14..17)
4	reserved
5	reserved
6	reserved
7	reserved

6.4.1.5 Bit Assignment of parameter bytes

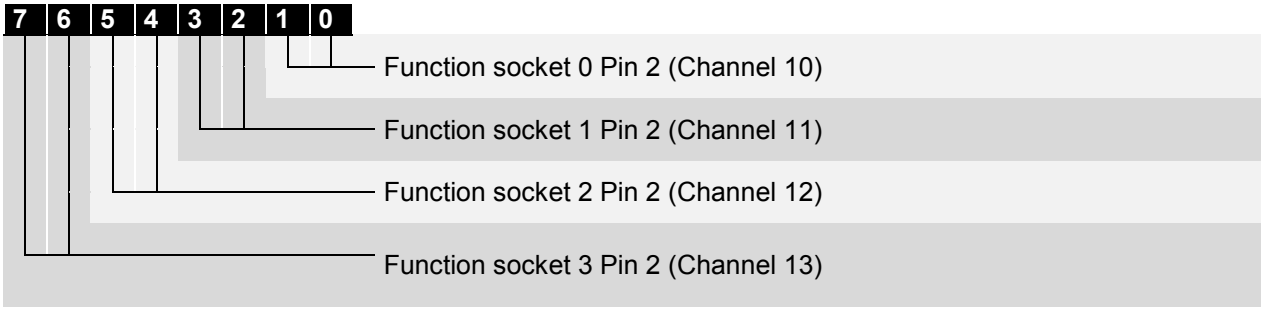
Byte 0 Function socket 0..3 Pin 4 (Channel 00..03)

7 6 5 4 3 2 1 0
Function socket 0 Pin 4 (Channel 00)
Function socket 1 Pin 4 (Channel 01)
Function socket 2 Pin 4 (Channel 02)
Function socket 3 Pin 4 (Channel 03)

Byte 1 Function socket 4..7 Pin 4 (Channel 04..07)

7 6 5 4 3 2 1 0
Function socket 4 Pin 4 (Channel 04)
Function socket 5 Pin 4 (Channel 05)
Function socket 6 Pin 4 (Channel 06)
Function socket 7 Pin 4 (Channel 07)

Byte 2 Function socket 0..3 Pin 2 (Channel 10..13)


7 6 5 4 3 2 1 0
Function socket 0 Pin 2 (Channel 10)
Function socket 1 Pin 2 (Channel 11)
Function socket 2 Pin 2 (Channel 12)
Function socket 3 Pin 2 (Channel 13)

Byte 3 Function socket 4..7 Pin 2 (Channel 14..17)

7 6 5 4 3 2 1 0
Function socket 4 Pin 2 (Channel 14)
Function socket 5 Pin 2 (Channel 15)
Function socket 6 Pin 2 (Channel 16)
Function socket 7 Pin 2 (Channel 17)

6.4.2 DIO16 E 8xM12 – Art.Nr. 56601xx

6.4.2.1 Identification

Description	Art. No.	Process data		Identification
		Input	Output	
DIO16 E 8xM12	56601	2 Byte	2 Byte	$C2_{hex}$ 01_{hex} 01_{hex} DD_{hex} 19_{hex}
DI16 E 8xM12	56601	2 Byte	-	42_{hex} 01_{hex} DD_{hex} $1B_{hex}$
DO16 E 8xM12	56601	-	2 Byte	82_{hex} 01_{hex} DD_{hex} $1D_{hex}$
DIO16 E 8xM12 VA	5660150	2 Byte	2 Byte	$C2_{hex}$ 01_{hex} 01_{hex} DD_{hex} 19_{hex}
DI16 E 8xM12 VA	5660150	2 Byte	-	42_{hex} 01_{hex} DD_{hex} $1B_{hex}$
DO16 E 8xM12 VA	5660150	-	2 Byte	82_{hex} 01_{hex} DD_{hex} $1D_{hex}$
DIO16 E 8xM12 VA	5660151	2 Byte	2 Byte	$C2_{hex}$ 01_{hex} 01_{hex} DD_{hex} 19_{hex}
DI16 E 8xM12 VA	5660151	2 Byte	-	42_{hex} 01_{hex} DD_{hex} $1B_{hex}$
DO16 E 8xM12 VA	5660151	-	2 Byte	82_{hex} 01_{hex} DD_{hex} $1D_{hex}$

6.4.2.2 Bit Assignment I/O - Data

6.4.2.2.1. Input Data IDM

Byte 0 (Pin 4 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00
Byte 1 (Pin 2 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	17	16	15	14	13	12	11	10

6.4.2.2.2. Output Data ODM

Byte 0 (Pin 4 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00
Byte 1 (Pin 2 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	17	16	15	14	13	12	11	10

6.4.2.3 Parameterization

For several parameters, more than two options are possible. Each of these parameters is coded with two bits. Values from 0dez to 3dez are therefore possible. Please note that the coding of the functions of Pin 2 and Pin 4 are not identical.

6.4.2.3.1. Function Pin 2

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Diagnostic input
3	1	1	Output

6.4.2.3.2. Function Pin 4

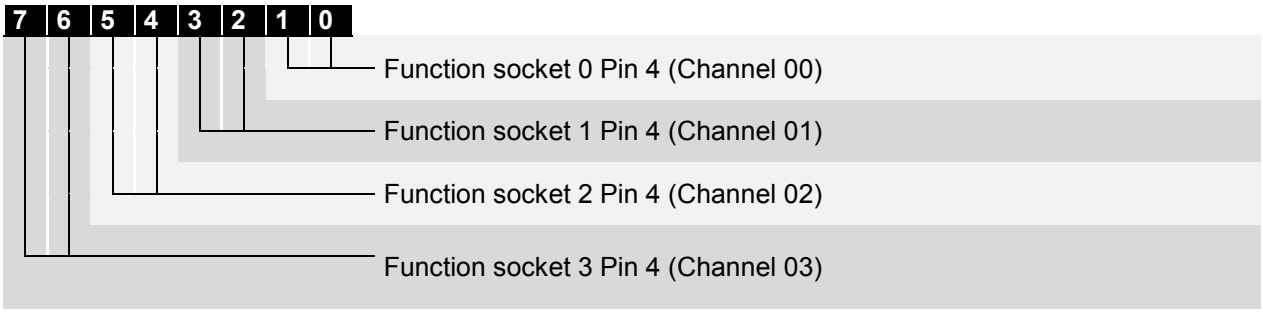
Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Output
3	1	1	reserved

6.4.2.4 Parameter bytes

Byte	Signification
0	Function socket 0..3 Pin 4 (Channel 00..03)
1	Function socket 4..7 Pin 4 (Channel 04..07)
2	Function socket 0..3 Pin 2 (Channel 10..13)
3	Function socket 4..7 Pin 2 (Channel 14..17)
4	reserved
5	reserved
6	reserved
7	reserved

6.4.2.5 Bit assignment of parameter bytes

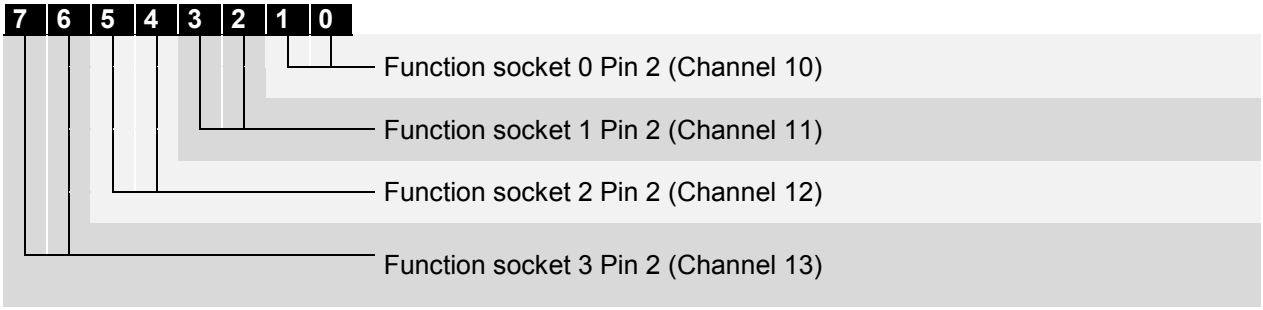
Byte 0 Function socket 0..3 Pin 4 (Channel 00..03)


7 6 5 4 3 2 1 0
Function socket 0 Pin 4 (Channel 00)
Function socket 1 Pin 4 (Channel 01)
Function socket 2 Pin 4 (Channel 02)
Function socket 3 Pin 4 (Channel 03)

Byte 1 Function socket 4..7 Pin 4 (Channel 04..07)

7 6 5 4 3 2 1 0
Function socket 4 Pin 4 (Channel 04)
Function socket 5 Pin 4 (Channel 05)
Function socket 6 Pin 4 (Channel 06)
Function socket 7 Pin 4 (Channel 07)

Byte 2 Function socket 0..3 Pin 2 (Channel 10..13)


7 6 5 4 3 2 1 0
Function socket 0 Pin 2 (Channel 10)
Function socket 1 Pin 2 (Channel 11)
Function socket 2 Pin 2 (Channel 12)
Function socket 3 Pin 2 (Channel 13)

Byte 3 Function socket 4..7 Pin 2 (Channel 14..17)

7 6 5 4 3 2 1 0
Function socket 4 Pin 2 (Channel 14)
Function socket 5 Pin 2 (Channel 15)
Function socket 6 Pin 2 (Channel 16)
Function socket 7 Pin 2 (Channel 17)

6.4.3 DI16 C 8xM12 – Art.Nr. 56602

6.4.3.1 Identification

Description	Art. No.	Process data		Identification
		Input	Output	
DI16 C 8xM12	56602	2 bytes	-	42_{hex} 01_{hex} DD_{hex} $1A_{hex}$

6.4.3.2 Bit Assignment I/O - Data

6.4.3.2.1. Input Data IDM

Byte 0 (Pin 4 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00
Byte 1 (Pin 2 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	17	16	15	14	13	12	11	10

6.4.3.3 Parameterization

For several parameters, more than two options are possible. Each of these parameters is coded with two bits. Values from 0dez to 3dez are therefore possible. Please note that the coding of the functions of Pin 2 and Pin 4 are not identical.

6.4.3.3.1. Function Pin 2

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Diagnostic input
3	1	1	reserved

6.4.3.3.2. Function Pin 4

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	reserved
3	1	1	reserved

6.4.3.4 Parameter bytes

Byte	Signification
0	Function socket 0..3 Pin 4 (Channel 00..03)
1	Function socket 4..7 Pin 4 (Channel 04..07)
2	Function socket 0..3 Pin 2 (Channel 10..13)
3	Function socket 4..7 Pin 2 (Channel 14..17)
4	reserved
5	reserved
6	reserved
7	reserved

6.4.3.5 Bit assignment of parameter bytes

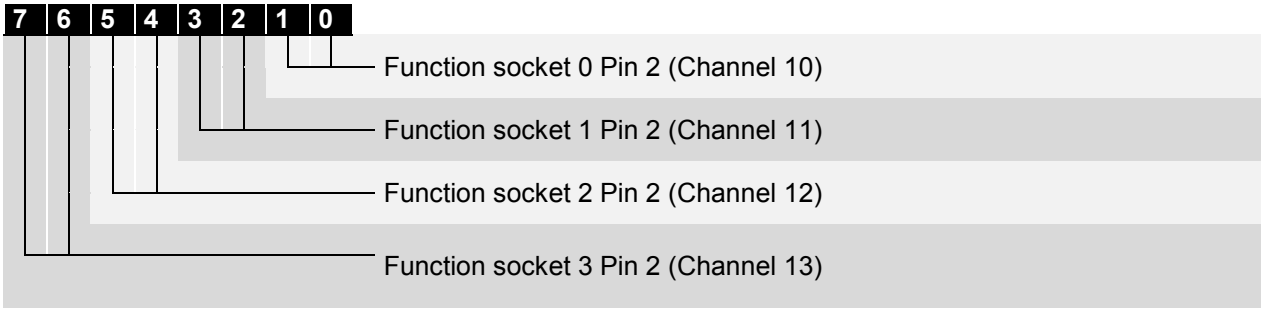
Byte 0 Function socket 0..3 Pin 4 (Channel 00..03)

7 6 5 4 3 2 1 0
Function socket 0 Pin 4 (Channel 00)
Function socket 1 Pin 4 (Channel 01)
Function socket 2 Pin 4 (Channel 02)
Function socket 3 Pin 4 (Channel 03)

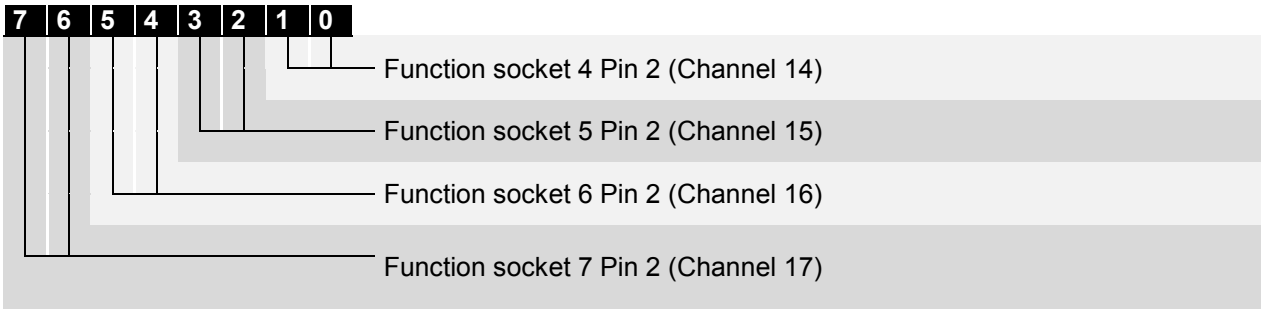
Byte 1 Function socket 4..7 Pin 4 (Channel 04..07)

7 6 5 4 3 2 1 0
Function socket 4 Pin 4 (Channel 04)
Function socket 5 Pin 4 (Channel 05)
Function socket 6 Pin 4 (Channel 06)
Function socket 7 Pin 4 (Channel 07)

Byte 2 Function socket 0..3 Pin 2 (Channel 10..13)


7 6 5 4 3 2 1 0
Function socket 0 Pin 2 (Channel 10)
Function socket 1 Pin 2 (Channel 11)
Function socket 2 Pin 2 (Channel 12)
Function socket 3 Pin 2 (Channel 13)

Byte 3 Function socket 4..7 Pin 2 (Channel 14..17)


7 6 5 4 3 2 1 0
Function socket 4 Pin 2 (Channel 14)
Function socket 5 Pin 2 (Channel 15)
Function socket 6 Pin 2 (Channel 16)
Function socket 7 Pin 2 (Channel 17)

6.4.4 DI16 E 8xM12 – Art.Nr. 56603xx

6.4.4.1 Identification

Description	Art. No.	Process data		Identification
		Input	Output	
DI16 E 8xM12	56603	2 bytes	-	42_{hex} 01_{hex} DD_{hex} $1B_{hex}$
DI16 E 8xM12 VA	5660350	2 Byte	-	42_{hex} 01_{hex} DD_{hex} $1B_{hex}$

6.4.4.2 Bit Assignment I/O - Data

6.4.4.2.1. Input Data IDM

Byte 0 (Pin 4 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00
Byte 1 (Pin 2 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	17	16	15	14	13	12	11	10

6.4.4.3 Parameterization

For several parameters, more than two options are possible. Each of these parameters is coded with two bits. Values from 0dez to 3dez are therefore possible. Please note that the coding of the functions of Pin 2 and Pin 4 are not identical.

6.4.4.3.1. Function Pin 2

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Diagnostic input
3	1	1	reserved

6.4.4.3.2. Function Pin 4

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	reserved
3	1	1	reserved

6.4.4.4 Parameter bytes

Byte	Signification
0	Function socket 0..3 Pin 4 (Channel 00..03)
1	Function socket 4..7 Pin 4 (Channel 04..07)
2	Function socket 0..3 Pin 2 (Channel 10..13)
3	Function socket 4..7 Pin 2 (Channel 14..17)
4	reserved
5	reserved
6	reserved
7	reserved

6.4.4.5 Bit assignment of parameter bytes

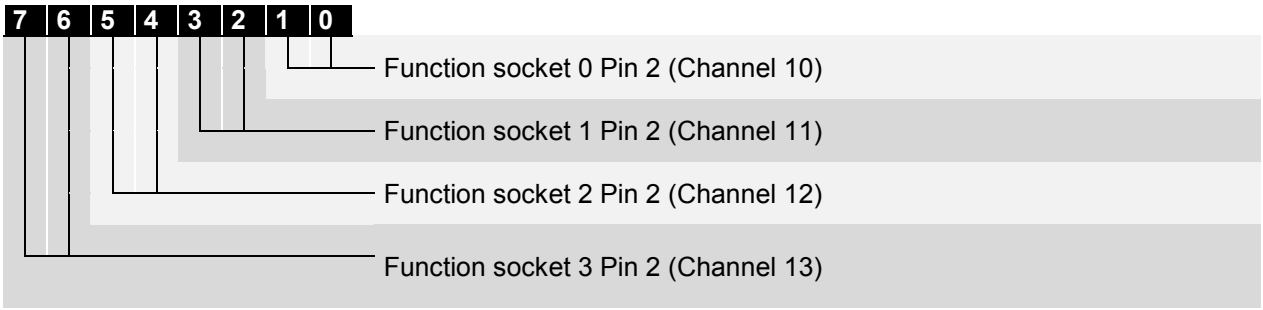
Byte 0 Function socket 0..3 Pin 4 (Channel 00..03)

7 6 5 4 3 2 1 0
Function socket 0 Pin 4 (Channel 00)
Function socket 1 Pin 4 (Channel 01)
Function socket 2 Pin 4 (Channel 02)
Function socket 3 Pin 4 (Channel 03)

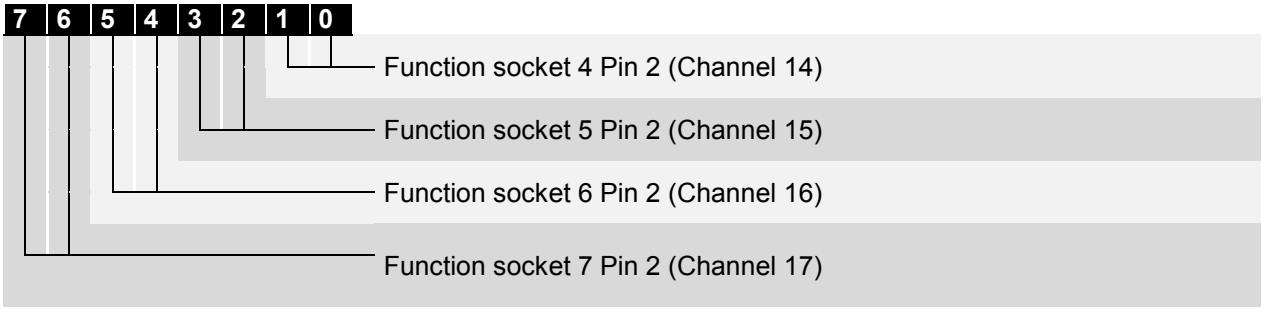
Byte 1 Function socket 4..7 Pin 4 (Channel 04..07)

7 6 5 4 3 2 1 0
Function socket 4 Pin 4 (Channel 04)
Function socket 5 Pin 4 (Channel 05)
Function socket 6 Pin 4 (Channel 06)
Function socket 7 Pin 4 (Channel 07)

Byte 2 Function socket 0..3 Pin 2 (Channel 10..13)


7 6 5 4 3 2 1 0
Function socket 0 Pin 2 (Channel 10)
Function socket 1 Pin 2 (Channel 11)
Function socket 2 Pin 2 (Channel 12)
Function socket 3 Pin 2 (Channel 13)

Byte 3 Function socket 4..7 Pin 2 (Channel 14..17)


7 6 5 4 3 2 1 0
Function socket 4 Pin 2 (Channel 14)
Function socket 5 Pin 2 (Channel 15)
Function socket 6 Pin 2 (Channel 16)
Function socket 7 Pin 2 (Channel 17)

6.4.5 DO12 E 6xM12 K3 – Art.Nr. 56605

6.4.5.1 Identification

Description	Art. No.	Process data		Identification
		Input	Output	
DO12 E 6xM12 K3	56605	-	2 bytes	82_{hex} 01_{hex} DD_{hex} $1D_{hex}$

6.4.5.2 Bit Assignment I/O - Data

6.4.5.2.1. Output Data ODM

Byte 0 (Channel 00 to 05)								
Bit	7	6	5	4	3	2	1	0
Channel	reserved	reserved	05	04	03	02	01	00
Byte 1 (Channel 10 to 15)								
Bit	7	6	5	4	3	2	1	0
Channel	reserved	reserved	15	14	13	12	11	10

6.4.5.3 Parameter bytes

Byte	Signification
4	reserved
5	reserved
6	reserved
7	reserved

6.4.6 DI16 E 8xM12 NPN – Art.Nr. 56606

6.4.6.1 Identification

Description	Art. No.	Process data		Identification
		Input	Output	
DI16 E 8xM12 NPN	56606	2 bytes	-	42_{hex} 01_{hex} DD_{hex} $1E_{hex}$

6.4.6.2 Bit Assignment I/O - Data

6.4.6.2.1. Input Data IDM

Byte 0 (Pin 4 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00
Byte 1 (Pin 2 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	17	16	15	14	13	12	11	10

6.4.6.3 Parameterization

For several parameters, more than two options are possible. Each of these parameters is coded with two bits. Values from 0dez to 3dez are therefore possible. Please note that the coding of the functions of Pin 2 and Pin 4 are not identical.

6.4.6.3.1. Function Pin 2

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	reserved
3	1	1	reserved

6.4.6.3.2. Function Pin 4

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	reserved
3	1	1	reserved

6.4.6.4 Parameter bytes

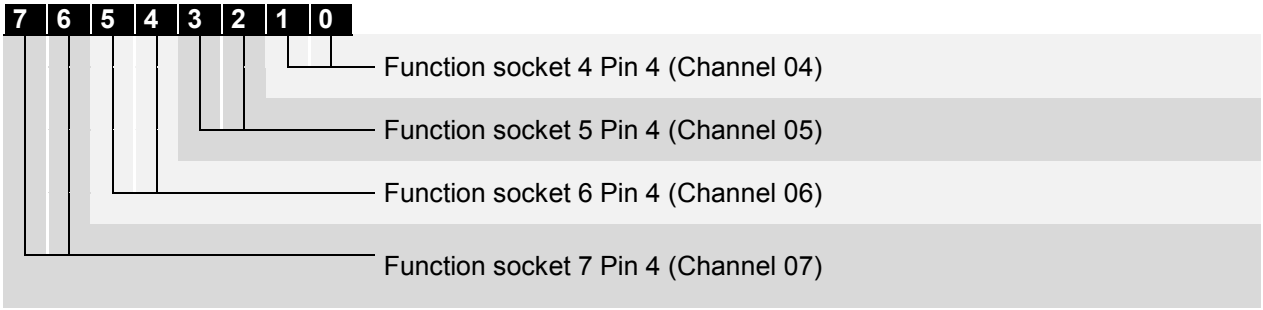
Byte	Signification
0	Function socket 0..3 Pin 4 (Channel 00..03)
1	Function socket 4..7 Pin 4 (Channel 04..07)
2	Function socket 0..3 Pin 2 (Channel 10..13)
3	Function socket 4..7 Pin 2 (Channel 14..17)
4	reserved
5	reserved
6	reserved
7	reserved

6.4.6.5 Bit assignment of parameter bytes

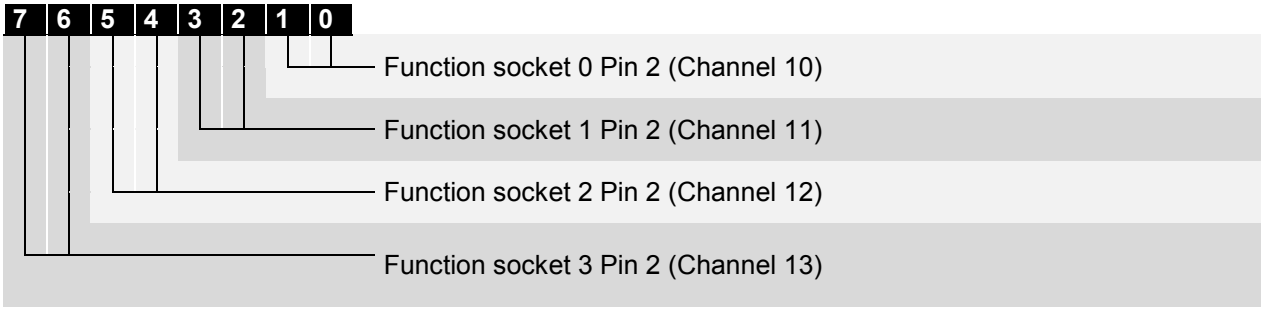
Byte 0 Function socket 0..3 Pin 4 (Channel 00..03)

7 6 5 4 3 2 1 0
Function socket 0 Pin 4 (Channel 00)
Function socket 1 Pin 4 (Channel 01)
Function socket 2 Pin 4 (Channel 02)
Function socket 3 Pin 4 (Channel 03)

Byte 1 Function socket 4..7 Pin 4 (Channel 04..07)


7 6 5 4 3 2 1 0
Function socket 4 Pin 4 (Channel 04)
Function socket 5 Pin 4 (Channel 05)
Function socket 6 Pin 4 (Channel 06)
Function socket 7 Pin 4 (Channel 07)

Byte 2 Function socket 0..3 Pin 2 (Channel 10..13)


7 6 5 4 3 2 1 0
Function socket 0 Pin 2 (Channel 10)
Function socket 1 Pin 2 (Channel 11)
Function socket 2 Pin 2 (Channel 12)
Function socket 3 Pin 2 (Channel 13)

Byte 3 Function socket 4..7 Pin 2 (Channel 14..17)

7 6 5 4 3 2 1 0
Function socket 4 Pin 2 (Channel 14)
Function socket 5 Pin 2 (Channel 15)
Function socket 6 Pin 2 (Channel 16)
Function socket 7 Pin 2 (Channel 17)

6.4.7 DIO8 C 4xM12 – Art.No. 56610

6.4.7.1 Identification

Bezeichnung	Art.No.	Process data		Identification
		Input	Output	
DIO8 C 4xM12	56610	2 bytes	2 bytes	$C2_{hex}$ 01_{hex} 01_{hex} DD_{hex} 22_{hex}
DI8 C 4xM12	56610	2 bytes	-	42_{hex} 01_{hex} DD_{hex} 24_{hex}
DO8 C 4xM12	56610	-	2 bytes	82_{hex} 01_{hex} DD_{hex} 26_{hex}

6.4.7.2 Bit Assignment I/O - Data

6.4.7.2.1. Input Data IDM

Byte 0 (Pin 4 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	-	-	-	-	03	02	01	00
Byte 1 (Pin 2 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	-	-	-	-	13	12	11	10

6.4.7.2.2. Output Data ODM

Byte 0 (Pin 4 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	-	-	-	-	03	02	01	00
Byte 1 (Pin 2 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	-	-	-	-	13	12	11	10

6.4.7.3 Parameterization

For several parameters, more than two options are possible. Each of these parameters is coded with two bits. Values from 0dez to 3dez are therefore possible. Please note that the coding of the functions of Pin 2 and Pin 4 is not identical.

6.4.7.3.1. Function Pin 2

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Diagnostic input
3	1	1	Output

6.4.7.3.2. Function Pin 4

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Output
3	1	1	reserved

6.4.7.4 Parameter bytes

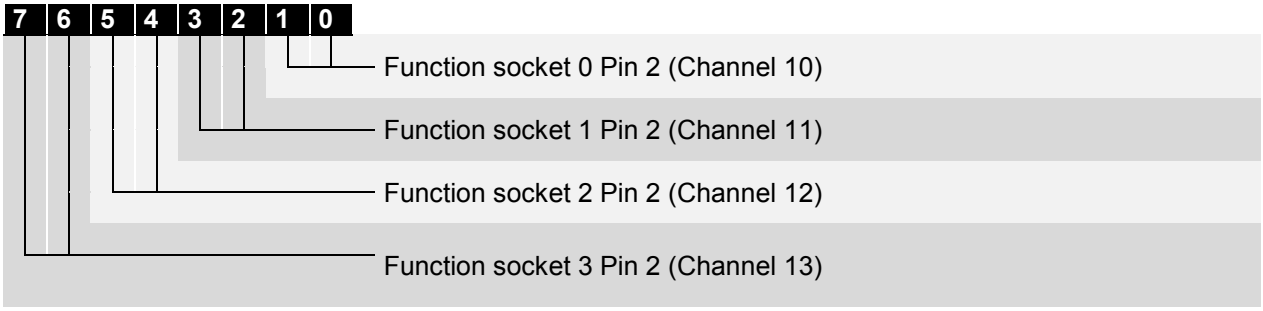
Byte	Signification
0	Function socket 0..3 Pin 4 (Channel 00..03)
1	Function socket 0..3 Pin 2 (Channel 10..13)
2	reserved
3	reserved

6.4.7.5 Bit assignment of parameter bytes

Byte 0 Function socket 0..3 Pin 4 (Channel 00..03)

7 6 5 4 3 2 1 0
Function socket 0 Pin 4 (Channel 00)
Function socket 1 Pin 4 (Channel 01)
Function socket 2 Pin 4 (Channel 02)
Function socket 3 Pin 4 (Channel 03)

Byte 1 Function socket 0..3 Pin 2 (Channel 10..13)


7 6 5 4 3 2 1 0
Function socket 0 Pin 2 (Channel 10)
Function socket 1 Pin 2 (Channel 11)
Function socket 2 Pin 2 (Channel 12)
Function socket 3 Pin 2 (Channel 13)

6.4.8 DIO8 E 4xM12 – Art.No. 56611xx

6.4.8.1 Identification

Bezeichnung	Art.No.	Process data		Identification
		Input	Output	
DIO8 E 4xM12	56611	2 bytes	2 bytes	$C2_{hex}$ 01_{hex} 01_{hex} DD_{hex} 23_{hex}
DI8 E 4xM12	56611	2 bytes	-	42_{hex} 01_{hex} DD_{hex} 25_{hex}
DO8 E 4xM12	56611	-	2 bytes	82_{hex} 01_{hex} DD_{hex} 27_{hex}
DIO8 E 4xM12 VA	5661150	2 bytes	2 bytes	$C2_{hex}$ 01_{hex} 01_{hex} DD_{hex} 23_{hex}
DI8 E 4xM12 VA	5661150	2 bytes	-	42_{hex} 01_{hex} DD_{hex} 25_{hex}
DO8 E 4xM12 VA	5661150	-	2 bytes	82_{hex} 01_{hex} DD_{hex} 27_{hex}

6.4.8.2 Bit Assignment I/O - Data

6.4.8.2.1. Inputdata IDM

Byte 0 (Pin 4 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	-	-	-	-	03	02	01	00
Byte 1 (Pin 2 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	-	-	-	-	13	12	11	10

6.4.8.2.2. Output Data ODM

Byte 0 (Pin 4 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	-	-	-	-	03	02	01	00
Byte 1 (Pin 2 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	-	-	-	-	13	12	11	10

6.4.8.3 Parameterization

For several parameters, more than two options are possible. Each of these parameters is coded with two bits. Values from 0dez to 3dez are therefore possible. Please note that the coding of the functions of Pin 2 and Pin 4 is not identical.

6.4.8.3.1. Function Pin 2

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Diagnostic input
3	1	1	Output

6.4.8.3.2. Function Pin 4

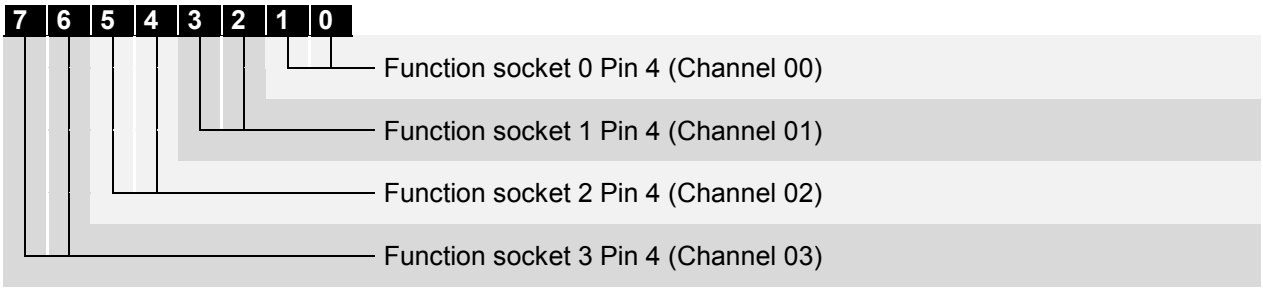
Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Output
3	1	1	reserved

6.4.8.4 Parameter bytes

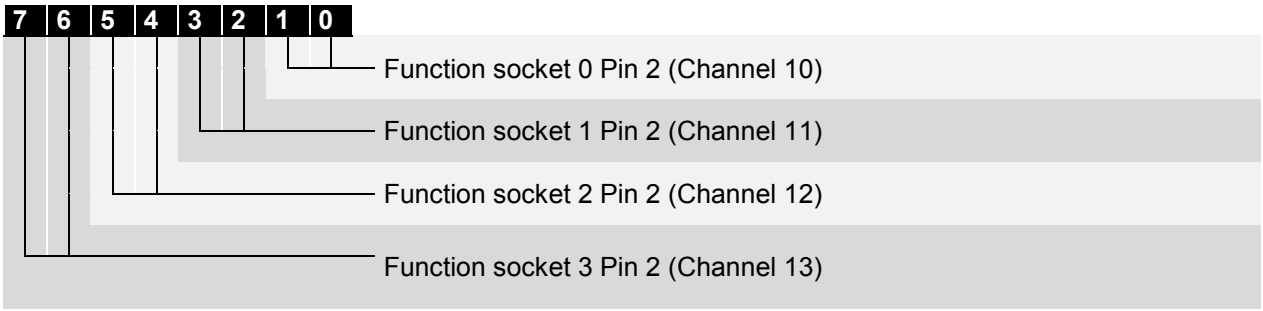
Byte	Signification
0	Function socket 0..3 Pin 4 (Channel 00..03)
1	Function socket 0..3 Pin 2 (Channel 10..13)
2	reserved
3	reserved

6.4.8.5 Bit assignment of parameter bytes

Byte 0 Function socket 0..3 Pin 4 (Channel 00..03)


7 6 5 4 3 2 1 0
Function socket 0 Pin 4 (Channel 00)
Function socket 1 Pin 4 (Channel 01)
Function socket 2 Pin 4 (Channel 02)
Function socket 3 Pin 4 (Channel 03)

Byte 1 Function socket 0..3 Pin 2 (Channel 10..13)


7 6 5 4 3 2 1 0
Function socket 0 Pin 2 (Channel 10)
Function socket 1 Pin 2 (Channel 11)
Function socket 2 Pin 2 (Channel 12)
Function socket 3 Pin 2 (Channel 13)

6.4.9 DI8 C 4xM12 – Art.No. 56612

6.4.9.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
DI8 C 4xM12	56612	2 bytes	-	42_{hex} 01_{hex} DD_{hex} 24_{hex}

6.4.9.2 Bit Assignment I/O - Data

6.4.9.2.1. Input Data IDM

Byte 0 (Pin 4 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	-	-	-	-	03	02	01	00
Byte 1 (Pin 2 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	-	-	-	-	13	12	11	10

6.4.9.3 Parameterization

For several parameters, more than two options are possible. Each of these parameters is coded with two bits. Values from 0dez to 3dez are therefore possible. Please note that the coding of the functions of Pin 2 and Pin 4 is not identical.

6.4.9.3.1. Function Pin 2

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Diagnostic input
3	1	1	reserved

6.4.9.3.2. Function Pin 4

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	reserved
3	1	1	reserved

6.4.9.4 Parameterbytes

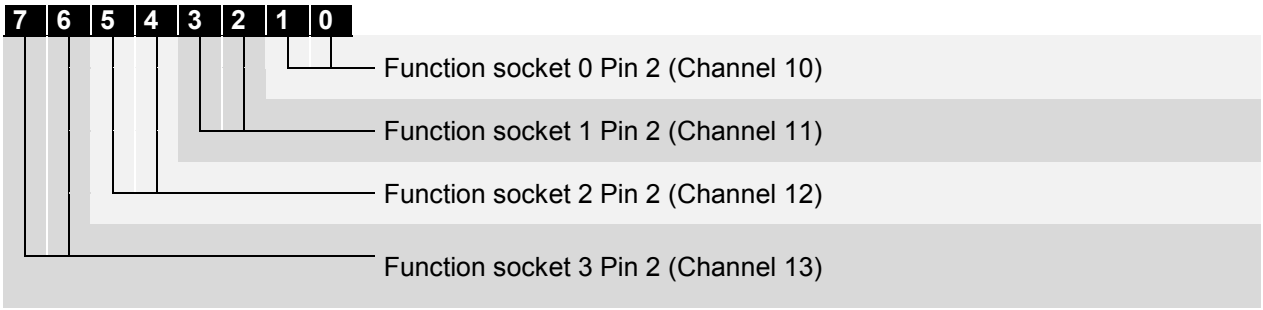
Byte	Signification
0	Function socket 0..3 Pin 4 (Channel 00..03)
1	Function socket 0..3 Pin 2 (Channel 10..13)
2	reserved
3	reserved

6.4.9.5 Bit assignment of parameter bytes

Byte 0 Function socket 0..3 Pin 4 (Channel 00..03)

7 6 5 4 3 2 1 0
Function socket 0 Pin 4 (Channel 00)
Function socket 1 Pin 4 (Channel 01)
Function socket 2 Pin 4 (Channel 02)
Function socket 3 Pin 4 (Channel 03)

Byte 1 Function socket 0..3 Pin 2 (Channel 10..13)


7 6 5 4 3 2 1 0
Function socket 0 Pin 2 (Channel 10)
Function socket 1 Pin 2 (Channel 11)
Function socket 2 Pin 2 (Channel 12)
Function socket 3 Pin 2 (Channel 13)

6.4.10 DI8 E 4xM12 – Art.No. 56613

6.4.10.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
DI8 E 4xM12	56613	2 bytes	-	42_{hex} 01_{hex} DD_{hex} 25_{hex}

6.4.10.2 Bit Assignment I/O - Data

6.4.10.2.1. Input Data IDM

Byte 0 (Pin 4 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	-	-	-	-	03	02	01	00
Byte 1 (Pin 2 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	-	-	-	-	13	12	11	10

6.4.10.3 Parameterization

For several parameters, more than two options are possible. Each of these parameters is coded with two bits. Values from 0dez to 3dez are therefore possible. Please note that the coding of the functions of Pin 2 and Pin 4 is not identical.

6.4.10.3.1. Function Pin 2

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Diagnostic input
3	1	1	reserved

6.4.10.3.2. Function Pin 4

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	reserved
3	1	1	reserved

6.4.10.4 Parameter bytes

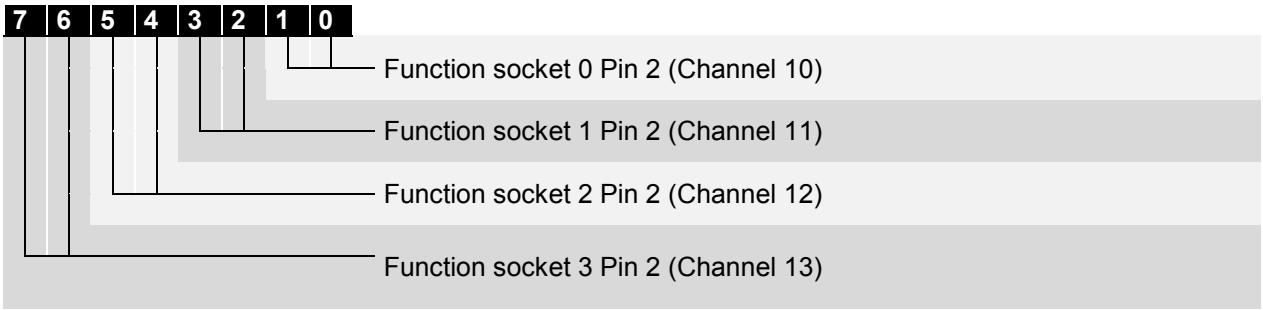
Byte	Signification
0	Function socket 0..3 Pin 4 (Channel 00..03)
1	Function socket 0..3 Pin 2 (Channel 10..13)
2	reserved
3	reserved

6.4.10.5 Bit assignment of parameter bytes

Byte 0 Function socket 0..3 Pin 4 (Channel 00..03)

7 6 5 4 3 2 1 0
Function socket 0 Pin 4 (Channel 00)
Function socket 1 Pin 4 (Channel 01)
Function socket 2 Pin 4 (Channel 02)
Function socket 3 Pin 4 (Channel 03)

Byte 1 Function socket 0..3 Pin 2 (Channel 10..13)


7 6 5 4 3 2 1 0
Function socket 0 Pin 2 (Channel 10)
Function socket 1 Pin 2 (Channel 11)
Function socket 2 Pin 2 (Channel 12)
Function socket 3 Pin 2 (Channel 13)

6.4.11 DI8 E 4xM12 NPN – Art.No. 56616

6.4.11.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
DI8 E 4xM12 NPN	56616	2 bytes	-	42_{hex} 01_{hex} DD_{hex} 28_{hex}

6.4.11.2 Bit Assignment I/O - Data

6.4.11.2.1. Input Data IDM

Byte 0 (Pin 4 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	-	-	-	-	03	02	01	00
Byte 1 (Pin 2 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	-	-	-	-	13	12	11	10

6.4.11.3 Parameterization

For several parameters, more than two options are possible. Each of these parameters is coded with two bits. Values from 0dez to 3dez are therefore possible. Please note that the coding of the functions of Pin 2 and Pin 4 is not identical.

6.4.11.3.1. Function Pin 2

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	reserved
3	1	1	reserved

6.4.11.3.2. Function Pin 4

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	reserved
3	1	1	reserved

6.4.11.4 Parameter bytes

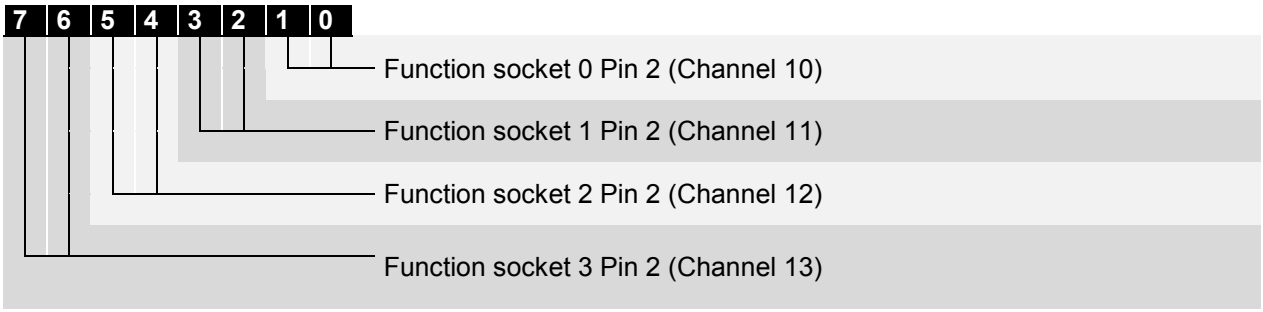
Byte	Signification
0	Function socket 0..3 Pin 4 (Channel 00..03)
1	Function socket 0..3 Pin 2 (Channel 10..13)
2	reserved
3	reserved

6.4.11.5 Bit assignment of parameter bytes

Byte 0 Function socket 0..3 Pin 4 (Channel 00..03)

7 6 5 4 3 2 1 0
Function socket 0 Pin 4 (Channel 00)
Function socket 1 Pin 4 (Channel 01)
Function socket 2 Pin 4 (Channel 02)
Function socket 3 Pin 4 (Channel 03)

Byte 1 Function socket 0..3 Pin 2 (Channel 10..13)


7 6 5 4 3 2 1 0
Function socket 0 Pin 2 (Channel 10)
Function socket 1 Pin 2 (Channel 11)
Function socket 2 Pin 2 (Channel 12)
Function socket 3 Pin 2 (Channel 13)

6.4.12 DIO8 C 8xM8 – Art.No. 56620

6.4.12.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
DIO8 C 8xM8	56620	1 Byte	1 Byte	$C2_{hex}$ 00_{hex} 00_{hex} DD_{hex} $2C_{hex}$
DI8 C 8xM8	56620	1 Byte	-	42_{hex} 00_{hex} DD_{hex} $2E_{hex}$
DO8 C 8xM8	56620	-	1 Byte	82_{hex} 00_{hex} DD_{hex} 30_{hex}

6.4.12.2 Bit Assignment I/O - Data

6.4.12.2.1. Input Data IDM

Byte 0 (Pin 4 of M8 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00

6.4.12.2.2. Output Data ODM

Byte 0 (Pin 4 of M8 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00

6.4.12.3 Parameterization

For several parameters, more than two options are possible. Each of these parameters is coded with two bits. Values from 0dez to 3dez are therefore possible. Please note that the coding of the functions of Pin 2 and Pin 4 is not identical.

6.4.12.3.1. Function Pin 4

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Output
3	1	1	reserved

6.4.12.4 Paramete rbytes

Byte	Signification
0	Function socket 0..3 Pin 4 (Channel 00..03)
1	Function socket 4..7 Pin 4 (Channel 04..07)
2	reserved
3	reserved

6.4.12.5 Bit assignment of parameter bytes

Byte 0 Function socket 0..3 Pin 4 (Channel 00..03)

7 6 5 4 3 2 1 0
Function socket 0 Pin 4 (Channel 00)
Function socket 1 Pin 4 (Channel 01)
Function socket 2 Pin 4 (Channel 02)
Function socket 3 Pin 4 (Channel 03)

Byte 1 Function socket 4..7 Pin 4 (Channel 04..07)

7 6 5 4 3 2 1 0
Function socket 4 Pin 4 (Channel 04)
Function socket 5 Pin 4 (Channel 05)
Function socket 6 Pin 4 (Channel 06)
Function socket 7 Pin 4 (Channel 07)

6.4.13 DIO8 E 8xM8 – ArtNr. 56621xx

6.4.13.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
DIO8 E 8xM8	56621	1 Byte	1 Byte	$C2_{hex}$ 00_{hex} 00_{hex} DD_{hex} $2D_{hex}$
DI8 E 8xM8	56621	1 Byte	-	42_{hex} 00_{hex} DD_{hex} $2F_{hex}$
DO8 E 8xM8	56621	-	1 Byte	82_{hex} 00_{hex} DD_{hex} 31_{hex}
DIO8 E 8xM8 VA	5662150	1 Byte	1 Byte	$C2_{hex}$ 00_{hex} 00_{hex} DD_{hex} $2D_{hex}$
DI8 E 8xM8 VA	5662150	1 Byte	-	42_{hex} 00_{hex} DD_{hex} $2F_{hex}$
DO8 E 8xM8 VA	5662150	-	1 Byte	82_{hex} 00_{hex} DD_{hex} 31_{hex}

6.4.13.2 Bit Assignment I/O - Data

6.4.13.2.1. Input Data IDM

Byte 0 (Pin 4 of M8 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00

6.4.13.2.2. Output Data ODM

Byte 0 (Pin 4 of M8 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00

6.4.13.3 Parameterization

For several parameters, more than two options are possible. Each of these parameters is coded with two bits. Values from 0dez to 3dez are therefore possible. Please note that the coding of the functions of Pin 2 and Pin 4 is not identical.

6.4.13.3.1. Function Pin 4

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Output
3	1	1	reserved

6.4.13.4 Parameter bytes

Byte	Signification
0	Function socket 0..3 Pin 4 (Channel 00..03)
1	Function socket 4..7 Pin 4 (Channel 04..07)
2	reserved
3	reserved

6.4.13.5 Bit assignment of parameter bytes

Byte 0 Function socket 0..3 Pin 4 (Channel 00..03)

7 6 5 4 3 2 1 0
Function socket 0 Pin 4 (Channel 00)
Function socket 1 Pin 4 (Channel 01)
Function socket 2 Pin 4 (Channel 02)
Function socket 3 Pin 4 (Channel 03)

Byte 1 Function socket 4..7 Pin 4 (Channel 04..07)

7 6 5 4 3 2 1 0
Function socket 4 Pin 4 (Channel 04)
Function socket 5 Pin 4 (Channel 05)
Function socket 6 Pin 4 (Channel 06)
Function socket 7 Pin 4 (Channel 07)

6.4.14 DI8 C 8xM8 – Art.No. 56622

6.4.14.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
DI8 C 8xM8	56622	1 Byte	-	42_{hex} 00_{hex} DD_{hex} $2E_{hex}$

6.4.14.2 Bit Assignment I/O - Data

6.4.14.2.1. Input Data IDM

Byte 0 (Pin 4 of M8 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00

6.4.14.3 Parameterization

For several parameters, more than two options are possible. Each of these parameters is coded with two bits. Values from 0dez to 3dez are therefore possible. Please note that the coding of the functions of Pin 2 and Pin 4 is not identical.

6.4.14.3.1. Function Pin 4

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	reserved
3	1	1	reserved

6.4.14.4 Parameterbytes

Byte	Signification
0	Function socket 0..3 Pin 4 (Channel 00..03)
1	Function socket 4..7 Pin 4 (Channel 04..07)
2	reserved
3	reserved

6.4.14.5 Bit assignment of parameter bytes

Byte 0 Function socket 0..3 Pin 4 (Channel 00..03)

7 6 5 4 3 2 1 0
Function socket 0 Pin 4 (Channel 00)
Function socket 1 Pin 4 (Channel 01)
Function socket 2 Pin 4 (Channel 02)
Function socket 3 Pin 4 (Channel 03)

Byte 1 Function socket 4..7 Pin 4 (Channel 04..07)

7 6 5 4 3 2 1 0
Function socket 4 Pin 4 (Channel 04)
Function socket 5 Pin 4 (Channel 05)
Function socket 6 Pin 4 (Channel 06)
Function socket 7 Pin 4 (Channel 07)

6.4.15 DI8 E 8xM8 – Art.No. 56623

6.4.15.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
DI8 E 8xM8	56623	1 Byte	-	42_{hex} 00_{hex} DD_{hex} $2F_{hex}$

6.4.15.2 Bit Assignment I/O - Data

6.4.15.2.1. Input Data IDM

Byte 0 (Pin 4 of M8 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00

6.4.15.3 Parameterization

For several parameters, more than two options are possible. Each of these parameters is coded with two bits. Values from 0dez to 3dez are therefore possible. Please note that the coding of the functions of Pin 2 and Pin 4 is not identical.

6.4.15.3.1. Function Pin 4

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Reserved
3	1	1	Reserved

6.4.15.4 Parameter bytes

Byte	Signification
0	Function socket 0..3 Pin 4 (Channel 00..03)
1	Function socket 4..7 Pin 4 (Channel 04..07)
2	reserved
3	reserved

6.4.15.5 Bit assignment of parameter bytes

Byte 0 Function socket 0..3 Pin 4 (Channel 00..03)

7 6 5 4 3 2 1 0
Function socket 0 Pin 4 (Channel 00)
Function socket 1 Pin 4 (Channel 01)
Function socket 2 Pin 4 (Channel 02)
Function socket 3 Pin 4 (Channel 03)

Byte 1 Function socket 4..7 Pin 4 (Channel 04..07)

7 6 5 4 3 2 1 0
Function socket 4 Pin 4 (Channel 04)
Function socket 5 Pin 4 (Channel 05)
Function socket 6 Pin 4 (Channel 06)
Function socket 7 Pin 4 (Channel 07)

6.4.16 DI8 E 8xM8 NPN – Art.No. 56626

6.4.16.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
DI8 E 8xM8 NPN	56626	1 Byte	-	42_{hex} 00_{hex} DD_{hex} 32_{hex}

6.4.16.2 Bit Assignment I/O - Data

6.4.16.2.1. Input Data IDM

Byte 0 (Pin 4 of M8 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00

6.4.16.3 Parameterization

For several parameters, more than two options are possible. Each of these parameters is coded with two bits. Values from 0dez to 3dez are therefore possible. Please note that the coding of the functions of Pin 2 and Pin 4 is not identical.

6.4.16.3.1. Function Pin 4

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Reserved
3	1	1	Reserved

6.4.16.4 Parameter bytes

Byte	Signification
0	Function socket 0..3 Pin 4 (Channel 00..03)
1	Function socket 4..7 Pin 4 (Channel 04..07)
2	reserved
3	reserved

6.4.16.5 Bit assignment of parameter bytes

Byte 0 Function socket 0..3 Pin 4 (Channel 00..03)

7 6 5 4 3 2 1 0
Function socket 0 Pin 4 (Channel 00)
Function socket 1 Pin 4 (Channel 01)
Function socket 2 Pin 4 (Channel 02)
Function socket 3 Pin 4 (Channel 03)

Byte 1 Function socket 4..7 Pin 4 (Channel 04..07)

7 6 5 4 3 2 1 0
Function socket 4 Pin 4 (Channel 04)
Function socket 5 Pin 4 (Channel 05)
Function socket 6 Pin 4 (Channel 06)
Function socket 7 Pin 4 (Channel 07)

6.4.17 DIO8 E 4xM12 1A – Art.No. 56631

6.4.17.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
DIO8 E 4xM12 1A	56631	2 bytes	2 bytes	$C2_{hex}$ 01_{hex} 01_{hex} DD_{hex} 37_{hex}

6.4.17.2 Bit Assignment I/O - Data

6.4.17.2.1. Input Data IDM

Byte 0 (Pin 4 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	-	-	-	-	03	02	01	00
Byte 1 (Pin 2 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	-	-	-	-	13	12	11	10

6.4.17.2.2. Output Data ODM

Byte 0 (Pin 4 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	-	-	-	-	03	02	01	00
Byte 1 (Pin 2 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	-	-	-	-	13	12	11	10

6.4.17.3 Parameterization

For several parameters, more than two options are possible. Each of these parameters is coded with two bits. Values from 0dez to 3dez are therefore possible. Please note that the coding of the functions of Pin 2 and Pin 4 is not identical.

6.4.17.3.1. Function Pin 2

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Diagnostic input
3	1	1	Output

6.4.17.3.2. Function Pin 4

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Output
3	1	1	reserved

6.4.17.4 Parameter bytes

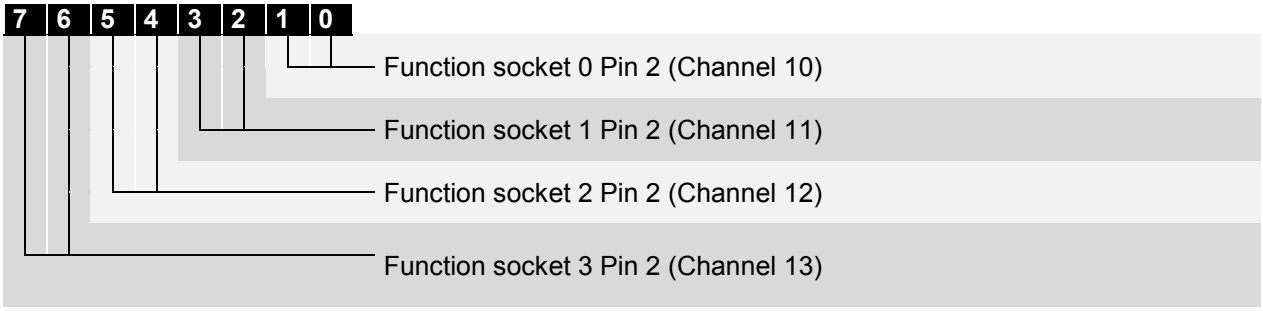
Byte	Signification
0	Function socket 0..3 Pin 4 (Channel 00..03)
1	Function socket 0..3 Pin 2 (Channel 10..13)
2	reserved
3	reserved

6.4.17.5 Bit assignment of parameter bytes

Byte 0 Function socket 0..3 Pin 4 (Channel 00..03)

7 6 5 4 3 2 1 0
Function socket 0 Pin 4 (Channel 00)
Function socket 1 Pin 4 (Channel 01)
Function socket 2 Pin 4 (Channel 02)
Function socket 3 Pin 4 (Channel 03)

Byte 1 Function socket 0..3 Pin 2 (Channel 10..13)


7 6 5 4 3 2 1 0
Function socket 0 Pin 2 (Channel 10)
Function socket 1 Pin 2 (Channel 11)
Function socket 2 Pin 2 (Channel 12)
Function socket 3 Pin 2 (Channel 13)

6.4.18 DIO16 C 8xM12 1,6A – Art.No. 56640

6.4.18.1 Identification

Art.No.	Description	Process data		Identification
		Input	Output	
56640	DIO 16 C 8xM12 1,6A	2 bytes	2 bytes	$C2_{hex}$ 01_{hex} 01_{hex} DD_{hex} 40_{hex}

6.4.18.2 Bit assignment I/O data

Input Data (IDM)								
Byte 0 (Pin 4 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00
Byte 1 (Pin 2 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	17	16	15	14	13	12	11	10

Output data (ODM)								
Byte 0 (Pin 4 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00
Byte 1 (Pin 2 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	17	16	15	14	13	12	11	10

6.4.18.3 Parameterization

For several parameters, more than two options are possible. Each of these parameters is coded with two bits. Values from 0dez to 3dez are therefore possible. Please note that the coding of the functions of Pin 2 and Pin 4 is not identical.

Function Pin 2

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Diagnostic input
3	1	1	Output

Function Pin 4

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Output
3	1	1	reserved

6.4.18.4 Parameter bytes

Byte	Signification
0	Function socket 0..3 Pin 4 (Channel 00..03)
1	Function socket 4..7 Pin 4 (Channel 04..07)
2	Function socket 0..3 Pin 2 (Channel 10..13)
3	Function socket 4..7 Pin 2 (Channel 14..17)
4	reserved
5	reserved
6	reserved
7	reserved

6.4.18.5 Bit assignment of parameter bytes

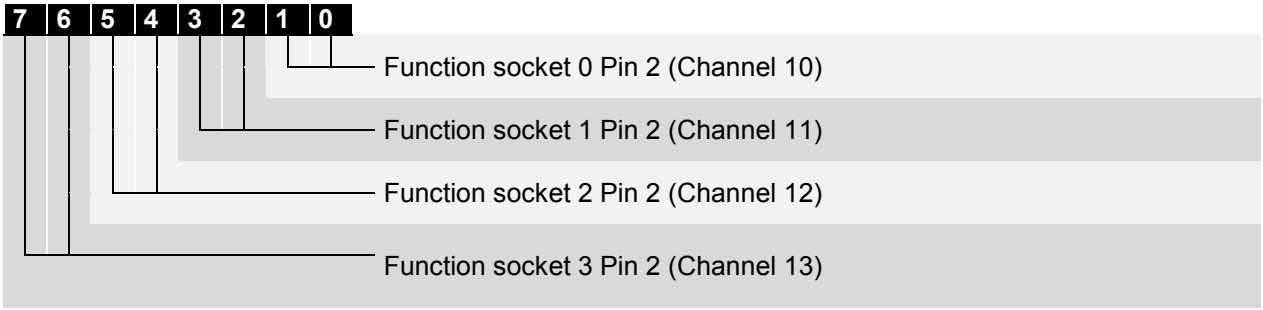
Byte 0 Function socket 0..3 Pin 4 (Channel 00..03)

7 6 5 4 3 2 1 0
Function socket 0 Pin 4 (Channel 00)
Function socket 1 Pin 4 (Channel 01)
Function socket 2 Pin 4 (Channel 02)
Function socket 3 Pin 4 (Channel 03)

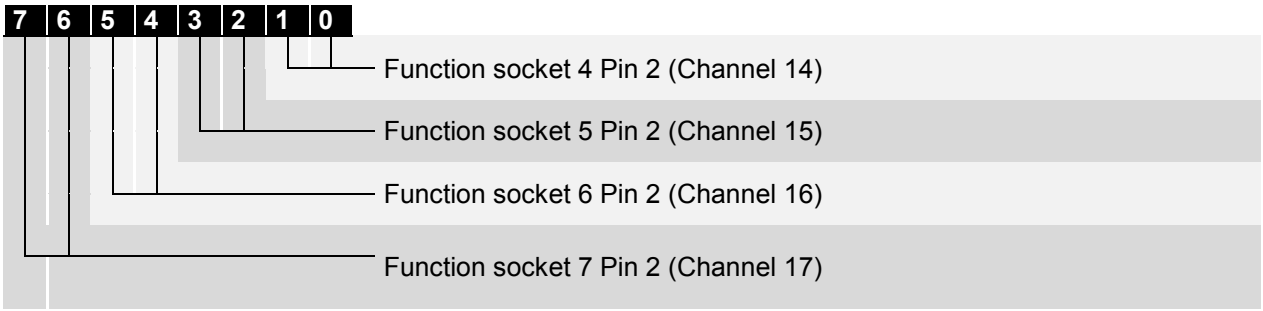
Byte 1 Function socket 4..7 Pin 4 (Channel 04..07)

7 6 5 4 3 2 1 0
Function socket 4 Pin 4 (Channel 04)
Function socket 5 Pin 4 (Channel 05)
Function socket 6 Pin 4 (Channel 06)
Function socket 7 Pin 4 (Channel 07)

Byte 2 Function socket 0..3 Pin 2 (Channel 10..13)


7 6 5 4 3 2 1 0
Function socket 0 Pin 2 (Channel 10)
Function socket 1 Pin 2 (Channel 11)
Function socket 2 Pin 2 (Channel 12)
Function socket 3 Pin 2 (Channel 13)

Byte 3 Function socket 4..7 Pin 2 (Channel 14..17)


7 6 5 4 3 2 1 0
Function socket 4 Pin 2 (Channel 14)
Function socket 5 Pin 2 (Channel 15)
Function socket 6 Pin 2 (Channel 16)
Function socket 7 Pin 2 (Channel 17)

6.4.19 DIO16 DO16 E 16xM12 (1,6/2A) – Art.No. 56641

6.4.19.1 Identification

Art.No.	Description	Process data		Identification
		Input	Output	
56641	DIO16 DO16 E 16xM12 (1,6/2A)	2 bytes	4 Byte	33_{Hex} 32_{Hex} 44_{Hex} 49_{Hex} $4F_{Hex}$

6.4.19.2 Bit assignment I/O data

Input data (IDM)								
Byte 0 (Pin 4 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00
Byte 1 (Pin 2 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	17	16	15	14	13	12	11	10

Output data (ODM)								
Byte 0 (Pin 4 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00
Byte 1 (Pin 2 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	17	16	15	14	13	12	11	10
Byte 2 (Pin 4 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	27	26	25	24	23	22	21	20
Byte 3 (Pin 2 of M12 sockets)								
Bit	7	6	5	4	3	2	1	0
Channel	37	36	35	34	33	32	31	30

6.4.19.3 Parameterization

For several parameters, more than two options are possible. Each of these parameters is coded with two bits. Values from 0dez to 3dez are therefore possible. Please note that the coding of the functions of Pin 2 and Pin 4 is not identical.

Function Pin 2

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Diagnostic input
3	1	1	Output

Function Pin 4

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Output
3	1	1	reserved

6.4.19.4 Paramete rbytes

Byte	Signification
0	Function socket 0..3 Pin 4 (Channel 00..03)
1	Function socket 4..7 Pin 4 (Channel 04..07)
2	Function socket 0..3 Pin 2 (Channel 10..13)
3	Function socket 4..7 Pin 2 (Channel 14..17)
4	reserved
5	reserved
6	reserved
7	reserved

6.4.19.5 Bit assignment of parameter bytes

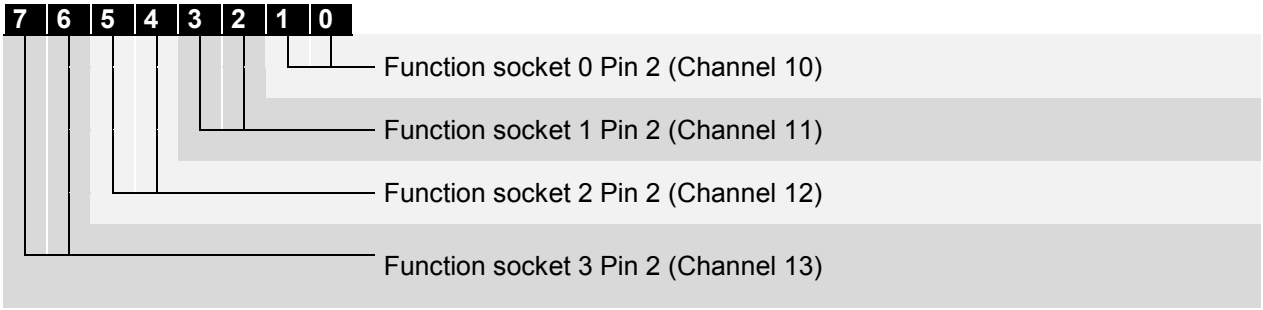
Byte 0 Function socket 0..3 Pin 4 (Channel 00..03)

7 6 5 4 3 2 1 0
Function socket 0 Pin 4 (Channel 00)
Function socket 1 Pin 4 (Channel 01)
Function socket 2 Pin 4 (Channel 02)
Function socket 3 Pin 4 (Channel 03)

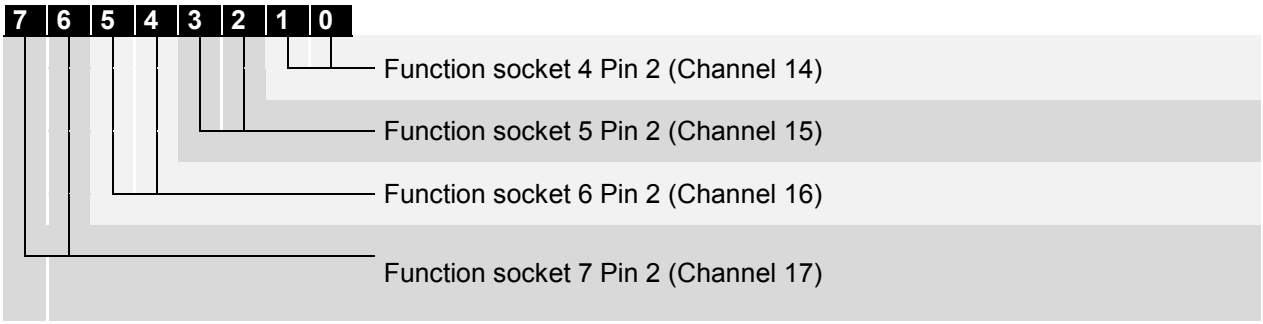
Byte 1 Function socket 4..7 Pin 4 (Channel 04..07)

7 6 5 4 3 2 1 0
Function socket 4 Pin 4 (Channel 04)
Function socket 5 Pin 4 (Channel 05)
Function socket 6 Pin 4 (Channel 06)
Function socket 7 Pin 4 (Channel 07)

Byte 2 Function socket 0..3 Pin 2 (Channel 10..13)


7 6 5 4 3 2 1 0
Function socket 0 Pin 2 (Channel 10)
Function socket 1 Pin 2 (Channel 11)
Function socket 2 Pin 2 (Channel 12)
Function socket 3 Pin 2 (Channel 13)

Byte 3 Function socket 4..7 Pin 2 (Channel 14..17)


7 6 5 4 3 2 1 0
Function socket 4 Pin 2 (Channel 14)
Function socket 5 Pin 2 (Channel 15)
Function socket 6 Pin 2 (Channel 16)
Function socket 7 Pin 2 (Channel 17)

6.4.20 DO16 C Valve K3 – Art.No. 56650

6.4.20.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
DO16 C Valve K3	56650	-	2 bytes	82_{hex} 01_{hex} DD_{hex} $4A_{hex}$

6.4.20.2 Bit assignment I/O data

6.4.20.2.1. Output data ODM

Byte 0 (Channel 00 to 07)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00
Byte 1 (Channel 08 to 15)								
Bit	7	6	5	4	3	2	1	0
Channel	15	14	13	12	11	10	09	08

6.4.20.3 Parameter bytes

Byte	Signification
4	reserved
5	reserved
6	reserved
7	reserved

6.4.21 DO8 C Valve CPV(9) K3 – Art. No. 5665003

6.4.21.1 Identification

Bezeichnung	Art.Nr.	Prozessdaten		Kennung
		Eingang	Ausgang	
DO8 C Valve K3	5665003	-	2 Byte	82_{hex} 01_{hex} DD_{hex} $4A_{hex}$

6.4.21.2 Bit assignment I/O data

6.4.21.2.1. Output data ODM

Byte 0 (Channel 00 bis 07)								
Bit	7	6	5	4	3	2	1	0
Channel	free	free	05	04	free	free	01	00
Byte 1 (Channel 08 bis 15)								
Bit	7	6	5	4	3	2	1	0
Channel	free	free	13	12	free	free	09	08

6.4.21.3 Parameter bytes

Byte	Bedeutung
4	reserved
5	reserved
6	reserved
7	reserved

6.4.22 DO16 E Valve – Art.No. 56651xx

6.4.22.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
DO16 E Valve	56651	-	2 bytes	82_{hex} 01_{hex} DD_{hex} $4B_{hex}$
DO16 E Valve CPV	5665100	-	2 bytes	82_{hex} 01_{hex} DD_{hex} $4B_{hex}$
DO16 E Valve V	5665101	-	2 bytes	82_{hex} 01_{hex} DD_{hex} $4B_{hex}$
DO16 E Valve V20/22	5665110	-	2 bytes	82_{hex} 01_{hex} DD_{hex} $4B_{hex}$
DO16 E Valve VM10	5665111	-	2 bytes	82_{hex} 01_{hex} DD_{hex} $4B_{hex}$
DO16 E Valve V20/22 B	5665112	-	2 bytes	82_{hex} 01_{hex} DD_{hex} $4B_{hex}$
DO16 E Valve SMC	5665113	-	2 bytes	82_{hex} 01_{hex} DD_{hex} $4B_{hex}$
DO16 E Valve SMC M27	5665114	-	2 bytes	82_{hex} 01_{hex} DD_{hex} $4B_{hex}$
DO16 E Valve V20/22 C	5665115	-	2 bytes	82_{hex} 01_{hex} DD_{hex} $4B_{hex}$
DO16 E Valve CPV VA	5665150	-	2 bytes	82_{hex} 01_{hex} DD_{hex} $4B_{hex}$
DO16 E Valve CPV VA	5665151	-	2 bytes	82_{hex} 01_{hex} DD_{hex} $4B_{hex}$

6.4.22.2 Bit assignment I/O data

6.4.22.2.1. Output data ODM

Byte 0 (Channel 00 to 07)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00
Byte 1 (Channel 08 to 15)								
Bit	7	6	5	4	3	2	1	0
Channel	15	14	13	12	11	10	09	08

6.4.22.3 Parameter bytes

Byte	Signification
4	reserved
5	reserved
6	reserved
7	reserved

6.4.23 DO16 E Valve – Art.No. 56653

6.4.23.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
DO16 E MAC	56653	-	2 bytes	82_{hex} 01_{hex} DD_{hex} $4D_{hex}$

6.4.23.2 Bit assignment I/O data

6.4.23.2.1. Output data ODM

Byte 0 (Channel 00 to 07)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00
Byte 1 (Channel 08 to 15)								
Bit	7	6	5	4	3	2	1	0
Channel	15	14	13	12	11	10	09	08

6.4.23.3 Parameter bytes

Byte	Signification
4	reserved
5	reserved
6	reserved
7	reserved

6.4.24 DO8 E Valve – Art.No. 56655xx

6.4.24.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
DO8 E Valve	56655	-	1 Byte	82_{hex} 00_{hex} DD_{hex} $4F_{hex}$
DO8 E Valve CPV	5665500	-	1 Byte	82_{hex} 00_{hex} DD_{hex} $4F_{hex}$
DO8 E Valve CPV (9)	5665501	-	1 Byte	82_{hex} 00_{hex} DD_{hex} $4F_{hex}$

6.4.24.2 Bit assignment I/O data

6.4.24.2.1. Output data ODM

Byte 0 (Channel 00 to 07)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00

6.4.24.3 Parameter bytes

Byte	Signification
4	reserved
5	reserved

6.4.25 DO32 E Valve 0,5A– Art.No. 56656xx

6.4.25.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
DO32 E Valve 0,5A	56656	-	4 Byte	82_{hex} 03_{hex} DD_{hex} 50_{hex}
DO24 E Valve VM10	5665600	-	4 Byte	82_{hex} 03_{hex} DD_{hex} 50_{hex}
DO32 E Valve MPA	5665601	-	4 Byte	82_{hex} 03_{hex} DD_{hex} 50_{hex}
DO32 E Valve HF03	5665602	-	4 Byte	82_{hex} 03_{hex} DD_{hex} 50_{hex}
DO32 E Valve VM10	5665603	-	4 Byte	82_{hex} 03_{hex} DD_{hex} 50_{hex}
DO23 E Valve SMC	5665604	-	4 Byte	82_{hex} 03_{hex} DD_{hex} 50_{hex}
DO22 E Valve CPA	5665605	-	4 Byte	82_{hex} 03_{hex} DD_{hex} 50_{hex}
DO24 E Valve HF04	5665606	-	4 Byte	82_{hex} 03_{hex} DD_{hex} 50_{hex}
DO24 E Valve SMC M27	5665607	-	4 Byte	82_{hex} 03_{hex} DD_{hex} 50_{hex}

6.4.25.2 Bit assignment I/O data

6.4.25.2.1. Output data ODM

Byte 0 (Channel 00 to 07)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00
Byte 1 (Channel 08 to 15)								
Bit	7	6	5	4	3	2	1	0
Channel	15	14	13	12	11	10	09	08
Byte 2 (Channel 16 to 23)								
Bit	7	6	5	4	3	2	1	0
Channel	23	22	21	20	19	18	17	16
Byte 3 (Channel 24 to 31)								
Bit	7	6	5	4	3	2	1	0
Channel	31	30	29	28	27	26	25	24

6.4.25.3 Parameter bytes

Byte	Signification
4	reserved
5	reserved
6	reserved
7	reserved
8	reserved
9	reserved
10	reserved
11	reserved

6.4.26 DO32 E MAC – Art.No. 56657

6.4.26.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
DO32 E MAC	56656	-	4 Byte	82_{hex} 03_{hex} DD_{hex} 51_{hex}

6.4.26.2 Bit assignment I/O data

6.4.26.2.1. Output data ODM

Byte 0 (Channel 00 to 07)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00
Byte 1 (Channel 08 to 15)								
Bit	7	6	5	4	3	2	1	0
Channel	15	14	13	12	11	10	09	08
Byte 2 (Channel 16 to 23)								
Bit	7	6	5	4	3	2	1	0
Channel	23	22	21	20	19	18	17	16
Byte 3 (Channel 24 to 31)								
Bit	7	6	5	4	3	2	1	0
Channel	31	30	29	28	27	26	25	24

6.4.26.3 Parameter bytes

Byte	Signification
4	reserved
5	reserved
6	reserved
7	reserved
8	reserved
9	reserved
10	reserved
11	reserved

6.4.27 DIO8 E Cable – ArtNr. 56661, DIO8 E Cable 2m - 5666100, DIO8 E Cable M12 ID – 5666500

6.4.27.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
DIO8 E Cable	56661	1 Byte	1 Byte	$C2_{hex}$ 00_{hex} 00_{hex} DD_{hex} 55_{hex}
DIO8 E Cable 2m	5666100	1 Byte	1 Byte	$C2_{hex}$ 00_{hex} 00_{hex} DD_{hex} 55_{hex}
DIO8 E Cable M12 ID	5666500	1 Byte	1 Byte	$C2_{hex}$ 00_{hex} 00_{hex} DD_{hex} 55_{hex}

6.4.27.2 Bit assignment I/O data

6.4.27.2.1. Input data IDM

Byte 0								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00

6.4.27.2.2. Output data ODM

Byte 0								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00

6.4.27.3 Parameterization

For several parameters, more than two options are possible. Each of these parameters is coded with two bits. Values from 0dez to 3dez are therefore possible.

6.4.27.3.1. Function I/O

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Output
3	1	1	reserved

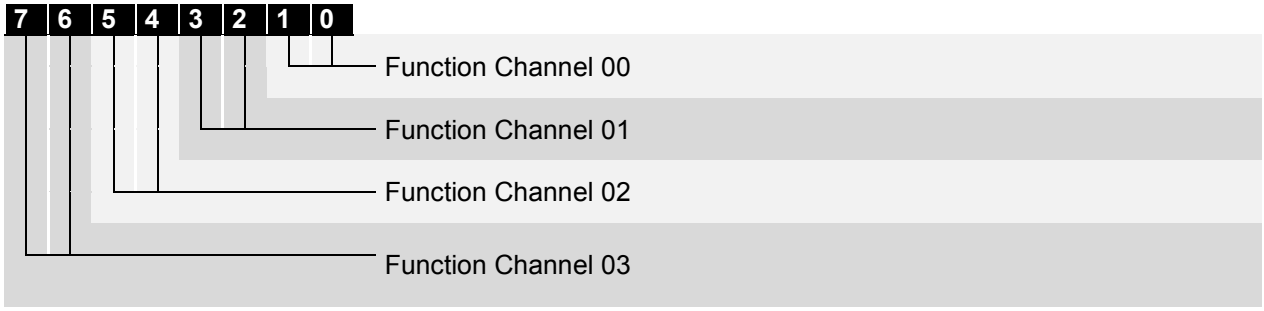
6.4.27.4 Parameter bytes

Byte	Signification
0	Function Channel 00..03
1	Function Channel 04..07
2	reserved

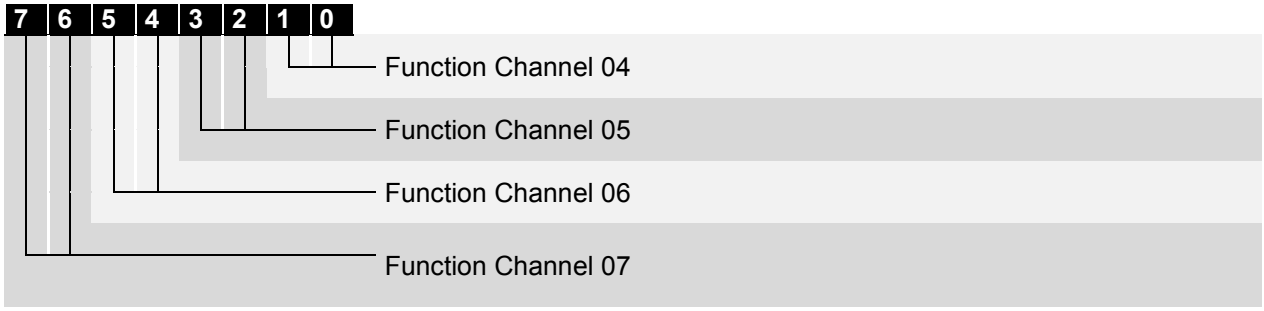
3	reserved

6.4.27.5 Bit assignment of parameter bytes

Byte 0 Function Channel 00..03



Byte 1 Function Channel 04..07



6.4.28 DIO16 E Cable 0,5A – ArtNr. 56662

6.4.28.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
DIO16 E Cable	56662	2 bytes	2 bytes	$C2_{hex}$ 01_{hex} 01_{hex} DD_{hex} 56_{hex}

6.4.28.2 Bit assignment I/O data

6.4.28.2.1. Input data IDM

Byte 0 (Channel 00 to 07)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00
Byte 1 (Channel 08 to 15)								
Bit	7	6	5	4	3	2	1	0
Channel	15	14	13	12	11	10	09	08

6.4.28.2.2. Output data ODM

Byte 0 (Channel 00 to 07)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00
Byte 1 (Channel 08 to 15)								
Bit	7	6	5	4	3	2	1	0
Channel	15	14	13	12	11	10	09	08

6.4.28.3 Parameterization

For several parameters, more than two options are possible. Each of these parameters is coded with two bits. Values from 0dez to 3dez are therefore possible.

6.4.28.3.1. Function I/O

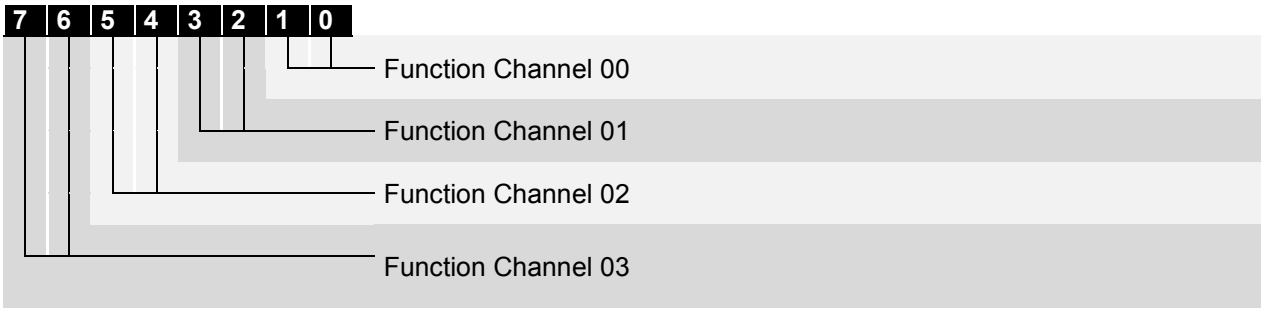
Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Output
3	1	1	reserved

6.4.28.4 Parameter bytes

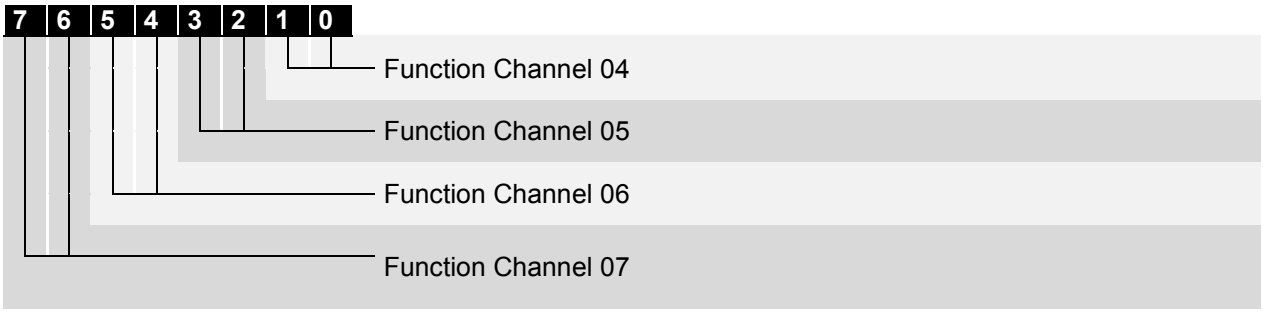
Byte	Signification
0	Function Channel 00..03
1	Function Channel 04..07
2	Function Channel 08..11
3	Function Channel 12..15

6.4.28.5 Bit assignment of parameter bytes

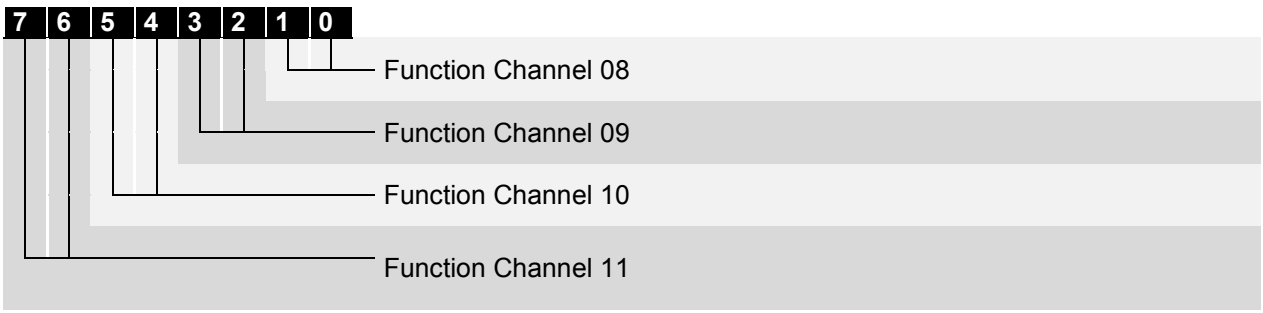
Byte 0 Function Channel 00..03



Byte 1 Function Channel 04..07



Byte 0 Function Channel 08..11



Byte 1 Function Channel 12..15

6.4.29 DIO8 E M16 0,5A – ArtNr. 56663

6.4.29.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
DIO8 E M16 0,5A	56663	1 Byte	1 Byte	$C2_{hex}$ 00_{hex} 00_{hex} DD_{hex} 57_{hex}

6.4.29.2 Bit assignment I/O data

6.4.29.2.1. Input data IDM

Byte 0								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00

6.4.29.2.2. Output data ODM

Byte 0								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00

6.4.29.3 Parameterization

For several parameters, more than two options are possible. Each of these parameters is coded with two bits. Values from 0dez to 3dez are therefore possible.

6.4.29.3.1. Function I/O

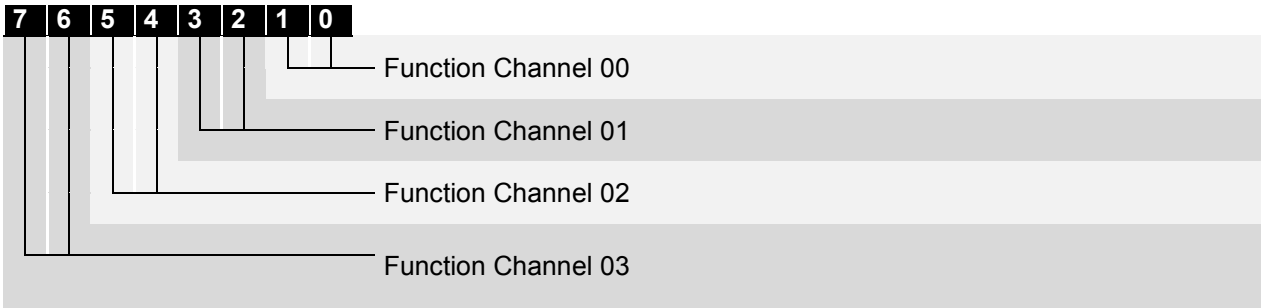
Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Output
3	1	1	reserved

6.4.29.4 Parameter bytes

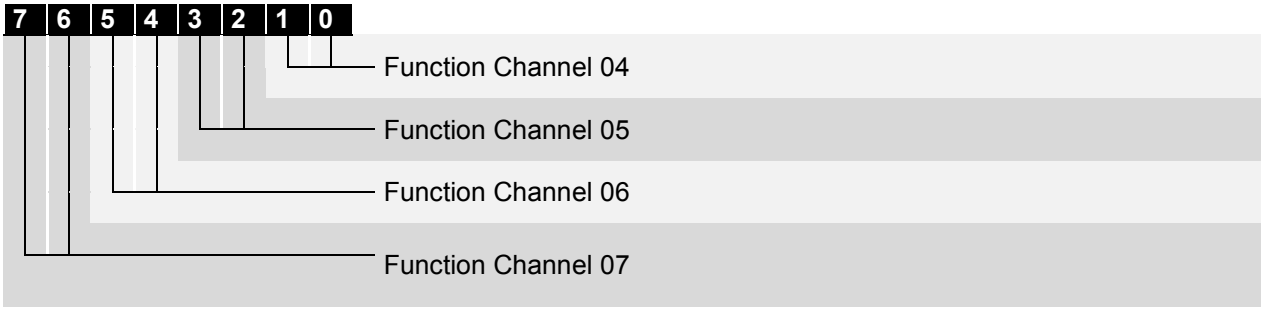
Byte	Signification
0	Function Channel 00..03
1	Function Channel 04..07
2	reserved
3	reserved

6.4.29.5 Bit assignment parameter bytes

Byte 0 Function Channel 00..03



Byte 1 Function Channel 04..07



6.4.30 DIO8/DI8 E TB Box – Art.No. 56681

6.4.30.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
DIO8/DI8 E TB Box	56681	2 bytes	2 bytes	$C2_{hex}$ 01_{hex} 01_{hex} DD_{hex} 69_{hex}

6.4.30.2 Bit assignment I/O data

6.4.30.2.1. Input data IDM

Byte 0 (Terminal X1)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00
Byte 1 (Terminal X0)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00

6.4.30.2.2. Output data ODM

Byte 0 (Terminal X1)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00
Byte 1 (Terminal X0)								
Bit	7	6	5	4	3	2	1	0
Channel	reserved	reserved	reserved	reserved	reserved	reserved	reserved	reserved

6.4.30.3 Parameterization

For several parameters, more than two options are possible. Each of these parameters is coded with two bits. Values from 0dez to 3dez are therefore possible. Please note that the coding of the functions of channel 00 to 07 (X0) and Channel 00 to 07 (X1) differs.

6.4.30.3.1. Function X0 Channel 00 to 07

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	reserved
3	1	1	reserved

6.4.30.3.2. Function X1 Channel 00 to 07

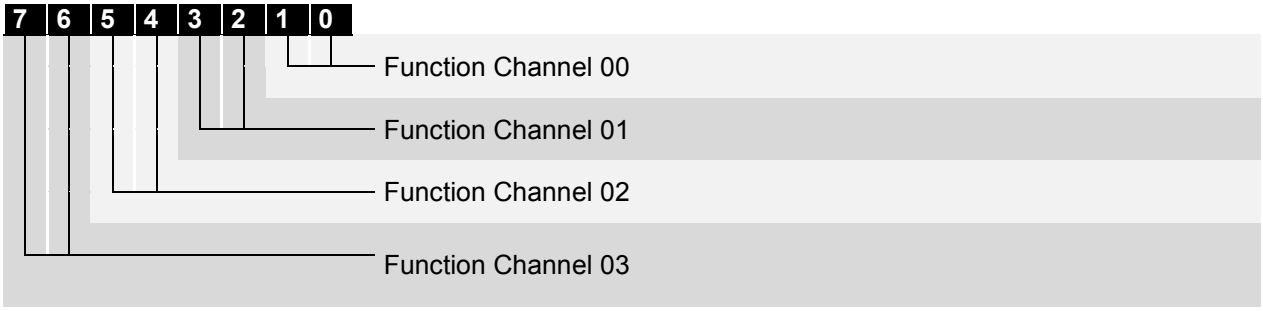
Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Output
3	1	1	reserved

6.4.30.4 Parameter bytes

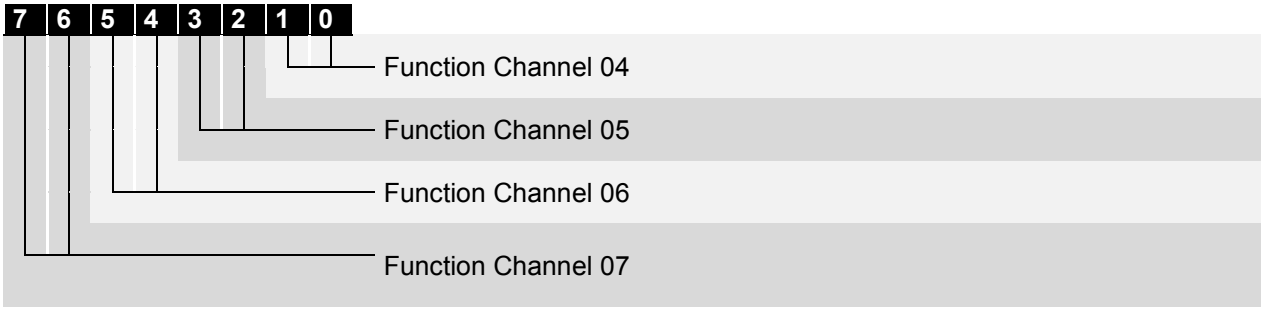
Byte	Signification
0	Function Channel 00..03
1	Function Channel 04..07
2	Function Channel 00..03
3	Function Channel 04..07
4	reserved
5	reserved

6.4.30.5 Bit assignment of parameter bytes

Byte 0 Function Channel X0 00..03



Byte 1 Function Channel X0 04..07



Byte 2 Function Channel X1 00..03

Byte 3 Function Channel X1 04..07

6.4.31 DIO8/DI8 E TB Rail – Art.No. 56691

6.4.31.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
DIO8/DI8 E TB Rail	56691	2 bytes	2 bytes	$C2_{hex}$ 01_{hex} 01_{hex} DD_{hex} 73_{hex}

6.4.31.2 Bit assignment I/O data

6.4.31.2.1. Input data IDM

Byte 0 (Terminal X1)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00
Byte 1 (Terminal X0)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00

6.4.31.2.2. Output data ODM

Byte 0 (Terminal X1)								
Bit	7	6	5	4	3	2	1	0
Channel	07	06	05	04	03	02	01	00
Byte 1 (Terminal X0)								
Bit	7	6	5	4	3	2	1	0
Channel	reserved	reserved	reserved	reserved	reserved	reserved	reserved	reserved

6.4.31.3 Parameterization

For several parameters, more than two options are possible. Each of these parameters is coded with two bits. Values from 0dez to 3dez are therefore possible. Please note that the coding of the functions of channel 00 to 07 (X0) and Channel 00 to 07 (X1) differs.

6.4.31.3.1. Function channel X0 00

Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	Output
3	1	1	reserved

6.4.31.3.2. Function X1 Channel 00 to 07

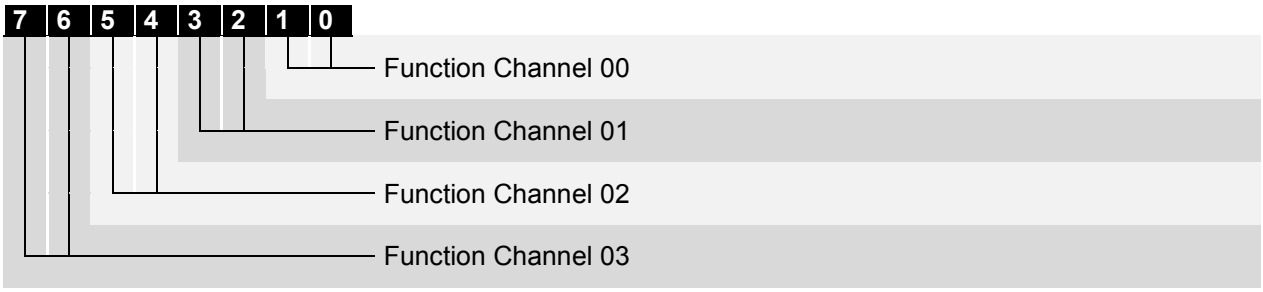
Decimal	Bit 1	Bit 0	Signification
0	0	0	NO input
1	0	1	NC input
2	1	0	reserved
3	1	1	reserved

6.4.31.3.3. Parameter bytes

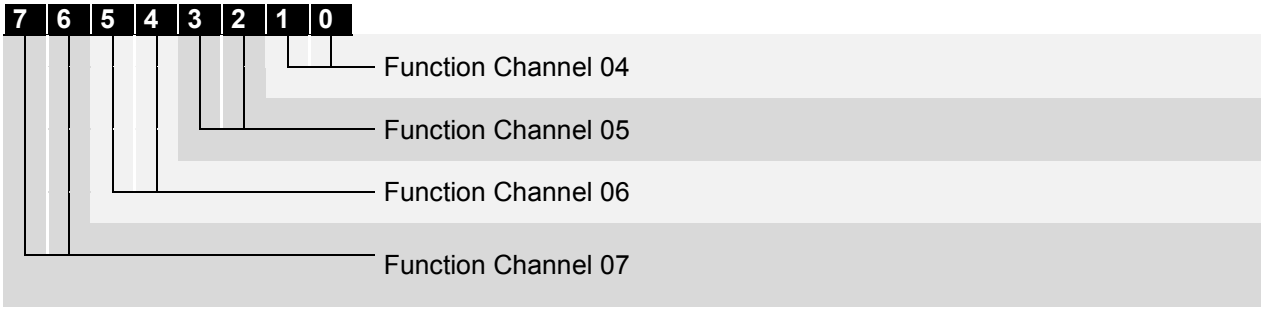
Byte	Signification
0	Function Channel 00..03
1	Function Channel 04..07
2	Function Channel 00..03
3	Function Channel 04..07
4	reserved
5	reserved

6.4.31.4 Bit assignment parameter bytes

Byte 0 Function Channel X0 00..03



Byte 1 Function Channel X0 04..07



Byte 2 Function Channel X1 00..03

Byte 3 Function Channel X1 04..07

6.5 Cube67 Analog I/O Modules

6.5.1 Specific Characteristics

6.5.1.1 Smoothing (AI4 (U) and AI4(I) modules only)

The analog signal can be prefiltered in the device, in order to reduce sensitivity to short-term jitter.

The measuring time per channel is 2.0 ms. The total cycle time is the result of the measuring time per channel + 2.5 ms. The diagram below illustrates the module behavior to a step response in an active channel.

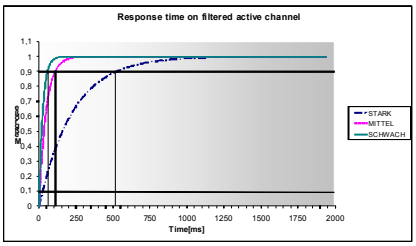


Figure 6-1: Time-dependent behavior of smoothing in Cube67 AI4 (U/I) modules

6.5.1.2 Delta (AI4 (U) and AI4(I) Modules Only

This value sets the number of increments to increase or reduce the last measured value, in order to send the analogue input value from the AI module to the bus node. This parameter can be used for reducing the bus load of the internal system connection.

Example: The last value measured was 1000. With a delta of 100, the next measurand will only be sent, if it is < 900 or > 1100.

6.5.1.3 50/60 Hz filter (AI4-RTD and AI4-TH only)

With the 50/60 Hz filter noise on the cabling can be suppressed. The AD converter from the RTD module will be switched into a special mode. As a result the cycle time will be 10 times higher than the standard time. When using platinum 1000 and nickel 1000 RTD sensors, using this filter is recommended.

6.5.2 AI4 C 4xM12 (U) – Art.No. 56700

6.5.2.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
AI4 C 4xM12 (U)	56700	4 Words	-	42_{hex} 43_{hex} DD_{hex} $7C_{hex}$

6.5.2.2 I/O Data

6.5.2.2.1. Input Data IDM

Word	0		1		2		3	
Byte	0	1	2	3	4	5	6	7
Value	Channel 0		Channel 1		Channel 2		Channel 3	

6.5.2.2.2. Byte sequence High/Low - Motorola (Standard setting)

Byte	Byte 0 (High-Byte)								Byte 1 (Low-Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	VZ	214	213	212	211	210	29	28	27	26	25	24	23	22	21	20

6.5.2.2.3. Byte sequence Low/High - Intel

Byte	Byte 0 (Low-Byte)								Byte 1 (High-Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	27	26	25	24	23	22	21	20	VZ	214	213	212	211	210	29	28

VZ = Sign

VZ = 0 Positive value

VZ = 1 Negative value

6.5.2.2.4. Representation of Analog Values

Measuring range 0..10 V	Measuring value			Range	Diagnostic
	binary	hexadecimal	decimal		
>10 V	0111 1111 1111 1111	7FFF	32767	Overshooting	Yes
10 V 5V 0.305mV 0	0111 1111 1111 1111 0011 1111 1111 1111 0000 0000 0000 0001 0000 0000 0000 0000	7FFF 3FFF 0001 0000	32767 16383 1 0	Nominal range	-
< 0V	0000 0000 0000 0000	0000	0	Undershooting	-

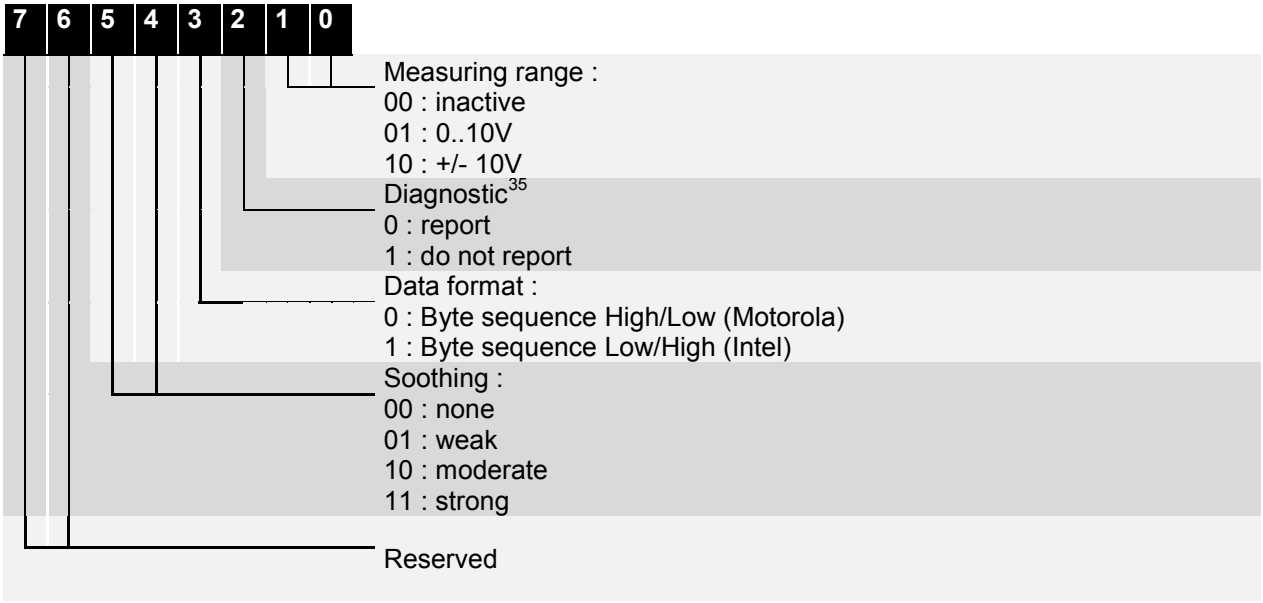
Measuring range +/-10 V	Measuring value			Range	Diagnostic
	binary	hexadecimal	decimal		
>10 V	0111 1111 1111 1111	7FFF	32767	Overshooting	Yes
10 V 5V 0.305mV 0	0111 1111 1111 1111 0011 1111 1111 1111 0000 0000 0000 0001 0000 0000 0000 0000	7FFF 3FFF 0001 0000	32767 16383 1 0	Nominal range	-
-0.305mV -5V -10V	1111 1111 1111 1111 1100 0000 0000 0001 1000 0000 0000 0000	FFFF C000 8000	-1 -16384 -32768	Nominal range	-
< -10V	1000 0000 0000 0000	8000	-32768	Undershooting	Yes

6.5.2.3 Parameter bytes

Byte	Signification
0	Settings Channel 0
1	Reserved
2	Channel 0 : Delta
3	
4	Settings Channel 1
5	Reserved
6	Channel 1 : Delta
7	
8	Settings Channel 2
9	Reserved
10	Channel 2 : Delta
11	
12	Settings Channel 3
13	Reserved
14	Channel 3 : Delta
15	

6.5.2.4 Bit assignment of parameter bytes

Byte 0,4,8,12 Settings Channel 0,1,2,3



Byte (2,3),(6,7),(10,11),(14,15) Channel (0,1,2,3) : Delta

Data type	Unsigned16
Admissible values	0..32767

Unused channels should be disabled in order to optimize cycle time.

[35] Diagnostic information of the corresponding channel.

6.5.3 AI4 E 4xM12 (U) – Art.No. 56701; AI4 E 4xM12 (U) VA – Art.No. 5670150

6.5.3.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
AI4 E 4xM12 (U)	56701	4 Words	-	42_{hex} 43_{hex} DD_{hex} $7D_{hex}$
AI4 E 4xM12 (U) VA	5670150	4 Words	-	42_{hex} 43_{hex} DD_{hex} $7D_{hex}$

6.5.3.2 I/O Data

6.5.3.2.1. Input Data IDM

Word	0		1		2		3	
Byte	0	1	2	3	4	5	6	7
Measuring value	Channel 0		Channel 1		Channel 2		Channel 3	

6.5.3.2.2. Byte sequence High/Low - Motorola (Standard setting)

Byte	Byte 0 (High-Byte)								Byte 1 (Low-Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	VZ	214	213	212	211	210	29	28	27	26	25	24	23	22	21	20

6.5.3.2.3. Byte sequence Low/High - Intel

Byte	Byte 0 (Low-Byte)								Byte 1 (High-Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	27	26	25	24	23	22	21	20	VZ	214	213	212	211	210	29	28

VZ = Sign

VZ = 0 Positive value

VZ = 1 Negative value

6.5.3.2.4. Representation of Analog Values

Measuring range 0..10 V	Measuring value			Range	Diagnostic
	binary	hexadecimal	decimal		
>10 V	0111 1111 1111 1111	7FFF	32767	Overshooting	Yes
10 V 5V 0.305mV 0	0111 1111 1111 1111 0011 1111 1111 1111 0000 0000 0000 0001 0000 0000 0000 0000	7FFF 3FFF 0001 0000	32767 16383 1 0	Nominal range	-
< 0V	0000 0000 0000 0000	0000	0	Undershooting	-

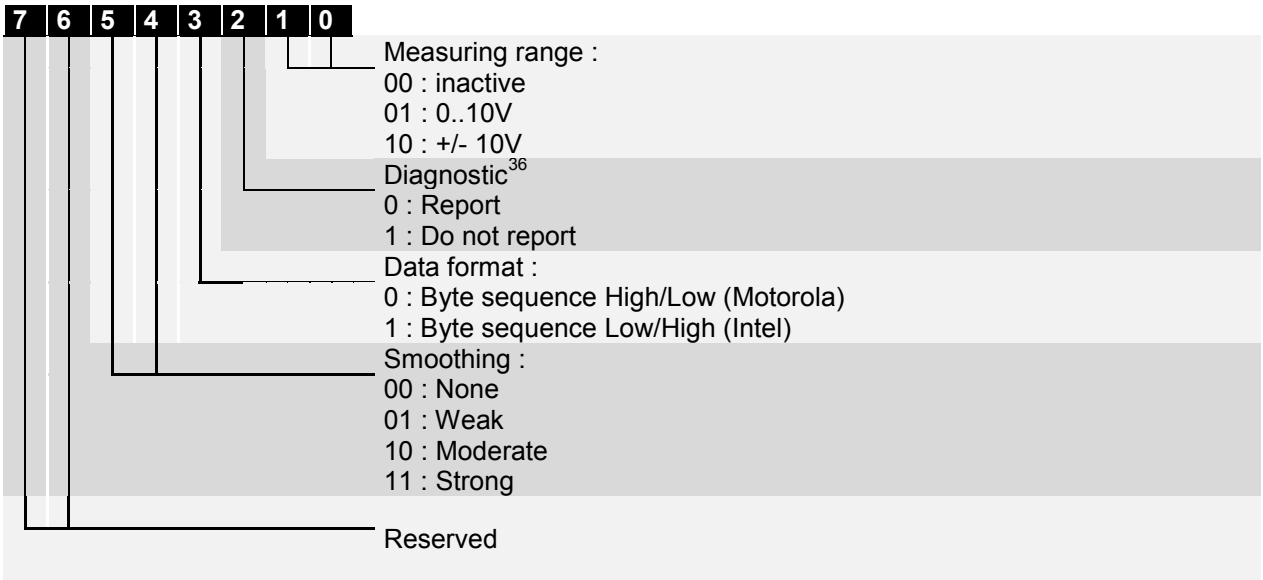
Measuring range +/-10 V	Measuring value			Range	Diagnostic
	binary	hexadecimal	decimal		
>10 V	0111 1111 1111 1111	7FFF	32767	Overshooting	Yes
10 V 5V 0.305mV 0	0111 1111 1111 1111 0011 1111 1111 1111 0000 0000 0000 0001 0000 0000 0000 0000	7FFF 3FFF 0001 0000	32767 16383 1 0	Nominal range	-
-0.305mV -5V -10V	1111 1111 1111 1111 1100 0000 0000 0001 1000 0000 0000 0000	FFFF C000 8000	-1 -16384 -32768	Nominal range	-
< -10V	1000 0000 0000 0000	8000	-32768	Undershooting	Yes

6.5.3.3 Parameter bytes

Byte	Signification
0	Settings Channel 0
1	Reserved
2	Channel 0 : Delta
3	
4	Settings Channel 1
5	Reserved
6	Channel 1 : Delta
7	
8	Settings Channel 2
9	Reserved
10	Channel 2 : Delta
11	
12	Settings Channel 3
13	Reserved
14	Channel 3 : Delta
15	

6.5.3.4 Bit assignment of parameter bytes

Byte 0,4,8,12 Settings Channel 0,1,2,3



[36] Diagnostic information of the corresponding channel.

Byte (2,3),(6,7),(10,11),(14,15) Channel (0,1,2,3) : Delta

Data type	Unsigned16
Admissible values	0..32767

Unused channels should be disabled in order to optimize cycle time.

6.5.4 AO4 C 4xM12 (U) – Art.No. 56710

6.5.4.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
AO4 C 4xM12 (U)	56710	-	4 Words	82_{hex} 43_{hex} DD_{hex} 86_{hex}

6.5.4.2 I/O Data

6.5.4.2.1. Output Data ODM

Word	0		1		2		3	
Byte	0	1	2	3	4	5	6	7
Measuring value	Channel 0		Channel 1		Channel 2		Channel 3	

6.5.4.2.2. Byte sequence High/Low - Motorola (Standard setting)

Byte	Byte 0 (High-Byte)								Byte 1 (Low-Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	VZ	-	-	-	-	210	29	28	27	26	25	24	23	22	21	20

6.5.4.2.3. Byte sequence Low/High - Intel

Byte	Byte 0 (Low-Byte)								Byte 1 (High-Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	27	26	25	24	23	22	21	20	VZ	-	-	-	-	210	29	28

6.5.4.2.4. Representation of Analog Values

Output range 0..10 V	Measuring value			Range
	binary	hexadecimal	decimal	
10 V 5V 0.305mV 0	0000 0111 1111 1111 0000 0011 1111 1111 0000 0000 0000 0001 0000 0000 0000 0000	07FF 03FF 0001 0000	2047 1023 1 0	Nominal range

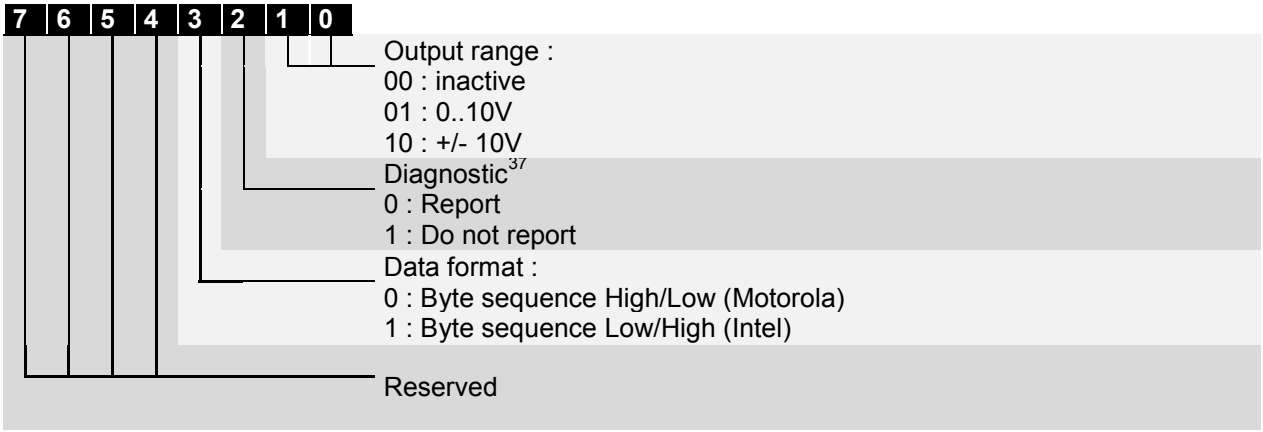
Output range +/-10 V	Measuring value			Range
	binary	hexadecimal	decimal	
10 V 5V 0.305mV 0	0000 0111 1111 1111 0000 0011 1111 1111 0000 0000 0000 0001 0000 0000 0000 0000	07FF 03FF 0001 0000	2047 1023 1 0	Nominal range
-0.305mV -5V -10V	1xxx x111 1111 1111 1xxx x100 0000 0001 1xxx x000 0000 0001	FFFF FC01 F800	-1 -1023 -2048	Nominal range

6.5.4.3 Parameter bytes

Byte	Signification
0	Settings Channel 0
1	Reserved
2	Reserved
3	Reserved
4	Settings Channel 1
5	Reserved
6	Reserved
7	Reserved
8	Settings Channel 2
9	Reserved
10	Reserved
11	Reserved
12	Settings Channel 3
13	Reserved
14	Reserved
15	Reserved

6.5.4.4 Bit assignment of parameter bytes

Byte 0,4,8,12 Settings Channel 0,1,2,3



Unused channels should be disabled in order to optimize cycle time.

[37] Diagnostic information of the corresponding channel.

6.5.5 AO4 E 4xM12 (U) – Art. No. 56711

6.5.5.1 Identification

Description	Art. No.	Process data		Identification
		Input	Output	
AO4 E 4xM12 (U)	56711	-	4 Words	82_{hex} 43_{hex} DD_{hex} 87_{hex}

6.5.5.2 I/O Data

6.5.5.2.1. Output data ODM

Word	0		1		2		3	
Byte	0	1	2	3	4	5	6	7
Measuring value	Channel 0		Channel 1		Channel 2		Channel 3	

6.5.5.2.2. Byte sequence High/Low - Motorola (Standard setting)

Byte	Byte 0 (High Byte)								Byte 1 (Low Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	ks	-	-	-	-	2^{10}	2^{9}	2^{8}	2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}

6.5.5.2.3. Byte sequence Low/High - Intel

Byte	Byte 0 (Low Byte)								Byte 1 (High Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}	VZ	-	-	-	-	2^{10}	2^{9}	2^{8}

6.5.5.2.4. Representation of Analog Values

Output range 0..10 V	Measuring value			Range
	binary	hexadecimal	decimal	
10 V 5V 0,305mV 0	0000 0111 1111 1111 0000 0011 1111 1111 0000 0000 0000 0001 0000 0000 0000 0000	07FF 03FF 0001 0000	2047 1023 1 0	Nominal range

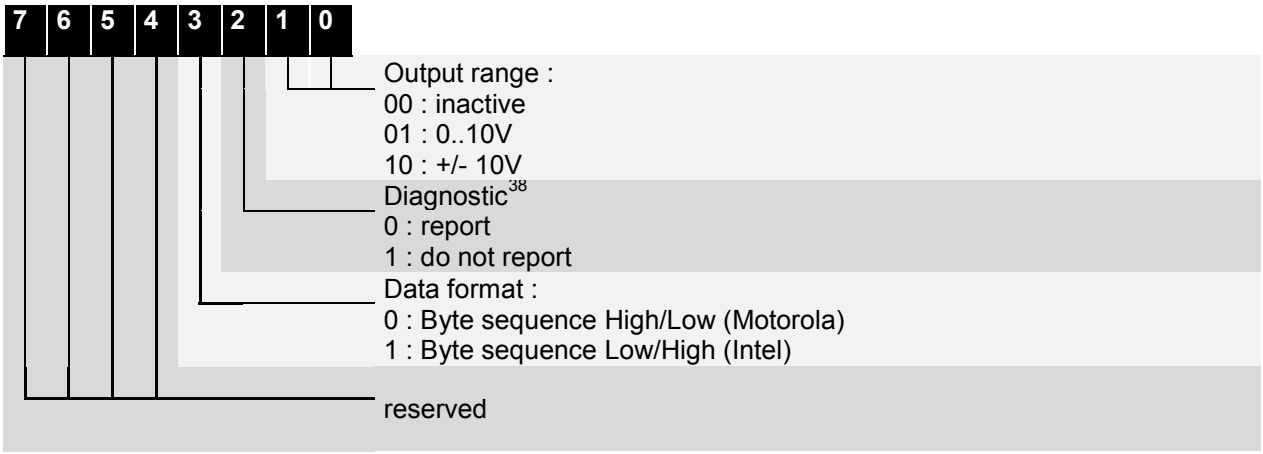
Output range +/-10 V	Measuring value			Range
	binary	hexadecimal	decimal	
10 V 5V 0,305mV 0	0000 0111 1111 1111 0000 0011 1111 1111 0000 0000 0000 0001 0000 0000 0000 0000	07FF 03FF 0001 0000	2047 1023 1 0	Nominal range
-0,305mV -5V -10V	1xxx x111 1111 1111 1xxx x100 0000 0001 1xxx x000 0000 0001	FFFF FC01 F800	-1 -1023 -2048	Nominal range

6.5.5.3 Parameter bytes

Byte	Signification
0	Settings Channel 0
1	reserved
2	reserved
3	reserved
4	Settings Channel 1
5	reserved
6	reserved
7	reserved
8	Settings Channel 2
9	reserved
10	reserved
11	reserved
12	Settings Channel 3
13	reserved
14	reserved
15	reserved

6.5.5.4 Bit assignment of parameter bytes

Byte 0,4,8,12 **Settings Channel 0,1,2,3**



Unused channels should be disabled in order to optimize cycle time.

[38] Bezieht sich auf die diesen Kanal betreffenden Diagnosen.

6.5.6 AO4 C 4xM12 (I) – Art.No. 56720, AO4 C 4xM12 (I) VA – Art.No. 5672050

6.5.6.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
AO4 C 4xM12 (I)	56720	-	4 Words	82_{hex} 43_{hex} DD_{hex} 90_{hex}
AO4 C 4xM12 (I) VA	5672050	-	4 Words	82_{hex} 43_{hex} DD_{hex} 90_{hex}

6.5.6.2 I/O Data

6.5.6.2.1. Output data ODM

Word	0		1		2		3	
Byte	0	1	2	3	4	5	6	7
Measuring value	Channel 0		Channel 1		Channel 2		Channel 3	

6.5.6.2.2. Byte sequence High/Low - Motorola (Standard setting)

Byte	Byte 0 (High-Byte)								Byte 1 (Low-Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	0	-	-	-	-	210	29	28	27	26	25	24	23	22	21	20

6.5.6.2.3. Byte sequence Low/High - Intel

Byte	Byte 0 (Low-Byte)								Byte 1 (High-Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	27	26	25	24	23	22	21	20	0	-	-	-	-	210	29	28

6.5.6.2.4. Representation of Analog Values

Output range 0..20 mA	Measuring value			Range
	binary	hexadecimal	decimal	
20 mA 10 mA 4 mA 0 mA	0xxx x111 1111 1111 0xxx x011 1111 1111 0xxx x001 1001 1001 0xxx x000 0000 0000	07FF 03FF 0199 0000	2047 1023 409 0	Nominal range

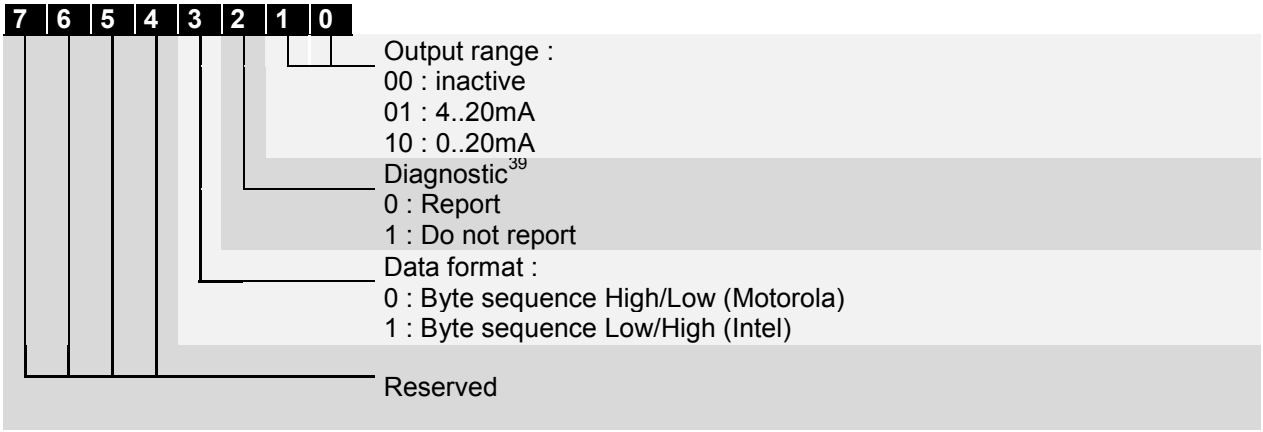
Output range 4..20 mA	Measuring value			Range
	binary	hexadecimal	decimal	
20 mA 10 mA 4 mA	0xxx x111 1111 1111 0xxx x010 1111 1111 0xxx x000 0000 0000	07FF 02FF 0000	2047 767 0	Nominal range

6.5.6.3 Parameter bytes

Byte	Signification
0	Settings Channel 0
1	Reserved
2	Reserved
3	Reserved
4	Settings Channel 1
5	Reserved
6	Reserved
7	Reserved
8	Settings Channel 2
9	Reserved
10	Reserved
11	Reserved
12	Settings Channel 3
13	Reserved
14	Reserved
15	Reserved

6.5.6.4 Bit assignment of paramete rbytes

Byte 0,4,8,12 Settings Channel 0,1,2,3



Unused channels should be disabled in order to optimize cycle time.

[39] Diagnostic information of the corresponding channel.

6.5.7 AO4 E 4xM12 (I) – Art.No. 56721

Identification

Description	Art.No.	Process data		Identification
		Input	Output	
AO4 E 4xM12 (I)	56721	-	4 Words	82_{hex} 43_{hex} DD_{hex} 91_{hex}

6.5.7.1 I/O data

6.5.7.1.1. Output data ODM

Word	0		1		2		3	
Byte	0	1	2	3	4	5	6	7
Measuring value	Channel 0		Channel 1		Channel 2		Channel 3	

6.5.7.1.2. Bytefolge High/Low - Motorola (Standard setting)

Byte	Byte 0 (High Byte)								Byte 1 (Low Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	0	-	-	-	-	2^{10}	2^{9}	2^{8}	2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}

6.5.7.1.3. Byte sequence Low/High - Intel

Byte	Byte 0 (Low Byte)								Byte 1 (High Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}	0	-	-	-	-	2^{10}	2^{9}	2^{8}

6.5.7.1.4. Representation of Analog Values

Output range 0..20 mA	Measuring value			Range
	binary	hexadecimal	decimal	
20 mA 10 mA 4 mA 0 mA	0xxx x111 1111 1111 0xxx x011 1111 1111 0xxx x001 1001 1001 0xxx x000 0000 0000	07FF 03FF 0199 0000	2047 1023 409 0	Nominal range

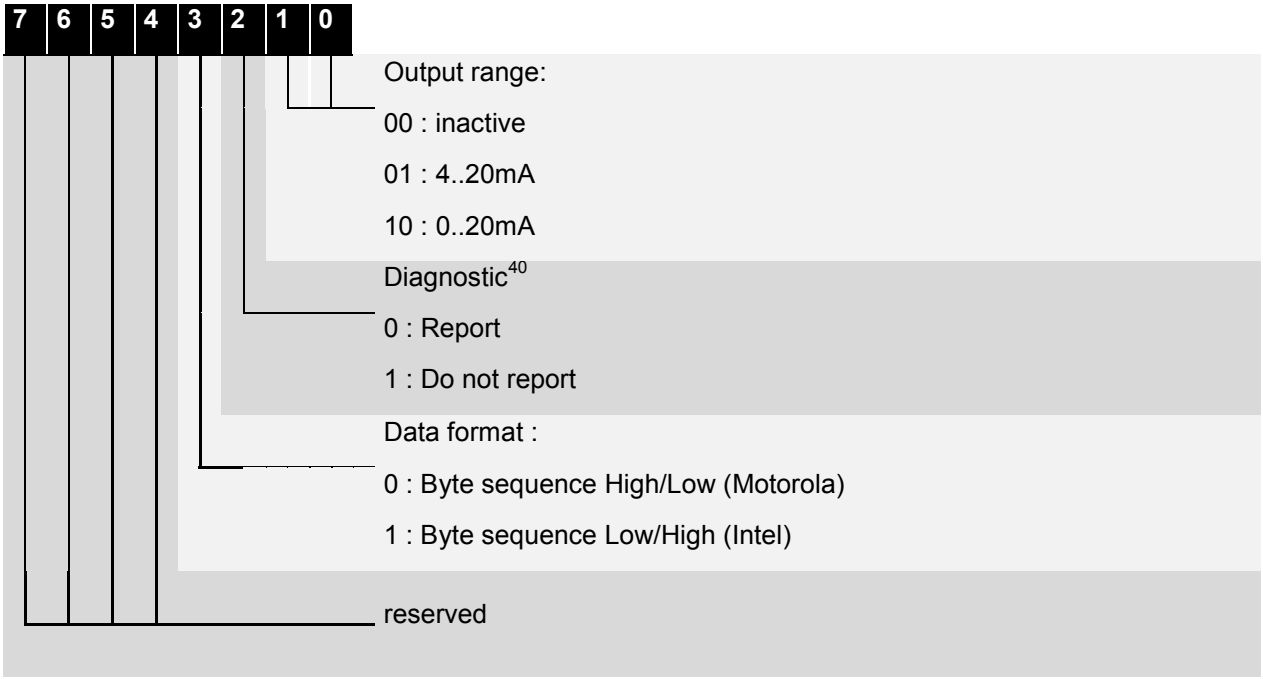
Output range 4..20 mA	Measuring value			Range
	binary	hexadecimal	decimal	
20 mA	0xxx x111 1111 1111	07FF	2047	
10 mA	0xxx x010 1111 1111	02FF	767	Nominal range
4 mA	0xxx x000 0000 0000	0000	0	

6.5.7.2 Parameter Bytes

Byte	Signification
0	Settings Channel 0
1	Reserved
2	Reserved
3	Reserved
4	Settings Channel 1
5	Reserved
6	Reserved
7	Reserved
8	Settings Channel 2
9	Reserved
10	Reserved
11	Reserved
12	Settings Channel 3
13	Reserved
14	Reserved
15	Reserved

6.5.7.3 Bit assignment of parameter bytes

Byte 0,4,8,12 **Settings Channel 0,1,2,3**



Unused channels should be disabled in order to optimize cycle time.

[40] Bezieht sich auf die diesen Kanal betreffenden Diagnosen.

6.5.8 AI4 C 4xM12 (I) – Art.No. 56730, AI4 C 4xM12 (I) VA – Art.No. 5673050

6.5.8.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
AI4 C 4xM12 (I)	56730	4 Words	-	42_{hex} 43_{hex} DD_{hex} $9A_{hex}$
AI4 C 4xM12 (I) VA	5673050	4 Words	-	42_{hex} 43_{hex} DD_{hex} $9A_{hex}$

6.5.8.2 I/O Data

6.5.8.2.1. Input Data IDM

Word	0		1		2		3	
Byte	0	1	2	3	4	5	6	7
Measuring value	Channel 0		Channel 1		Channel 2		Channel 3	

6.5.8.2.2. Byte sequence High/Low - Motorola (Standard setting)

Byte	Byte 0 (High-Byte)								Byte 1 (Low-Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	0	214	213	212	211	210	29	28	27	26	25	24	23	22	21	20

6.5.8.2.3. Byte sequence Low/High - Intel

Byte	Byte 0 (Low-Byte)								Byte 1 (High-Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	27	26	25	24	23	22	21	20	0	214	213	212	211	210	29	28

6.5.8.2.4. Representation of Analog Values

Measuring range 0..20 mA	Measuring value			Range	Diag-nostic
	binary	hexadecimal	decimal		
> 20 mA	0111 1111 1111 1111	7FFF	32767	Overshooting	Yes
20 mA 10 mA 4 mA 0	0111 1111 1111 1111 0011 1111 1111 1111 0001 1001 1001 1001 0000 0000 0000 0000	7FFF 3FFF 1999 0000	32767 16383 6553 0	Nominal range	-
< 0 mA	0000 0000 0000 0000	0000	0	Undershooting	-

Measuring range 4..20 mA	Measuring value			Range	Diag-nostic
	binary	hexadecimal	decimal		
>20 mA	0111 1111 1111 1111	7FFF	32767	Overshooting	Yes
20 mA 10 mA 4 mA	0111 1111 1111 1111 0010 1111 1111 1010 0000 0000 0000 0000	7FFF 2FFA 0000	32767 12282 0	Nominal range	-
< 4 mA	0000 0000 0000 0000	0000	0	Undershooting	Yes[41]

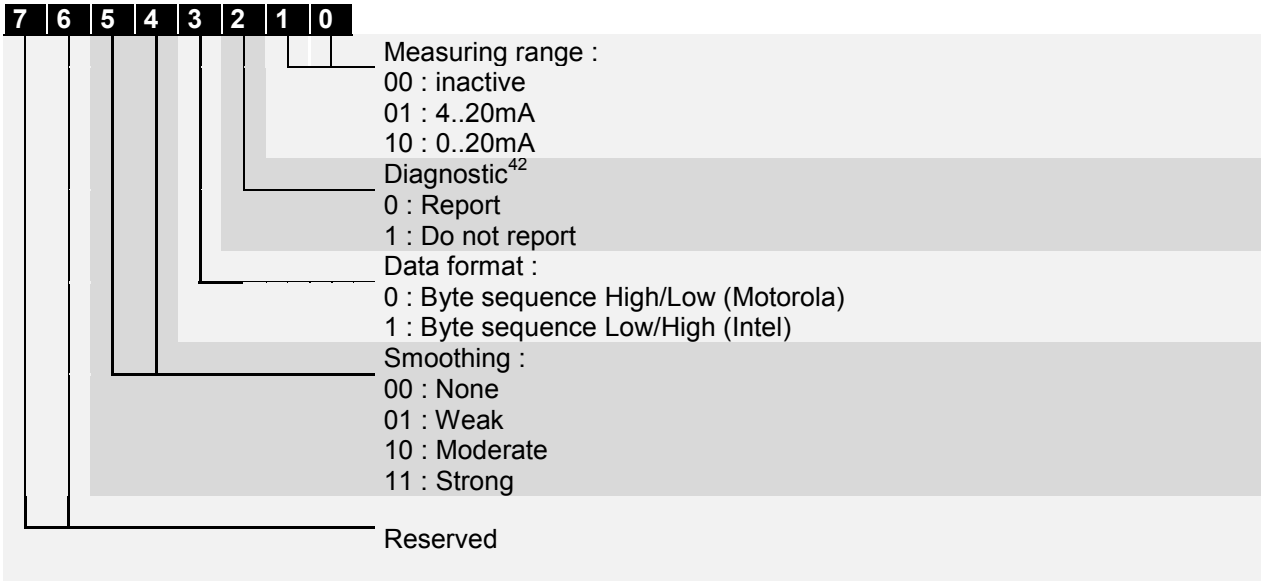
6.5.8.3 Parameter bytes

Byte	Signification
0	**Settings Channel 0**
1	Reserved
2 3	Channel 0 : Delta
4	**Settings Channel 1**
5	Reserved
6 7	Channel 1 : Delta
8	**Settings Channel 2**
9	Reserved
10 11	Channel 2 : Delta
12	**Settings Channel 3**
13	Reserved
14 15	Channel 3 : Delta

6.5.8.4 Bit assignment of parameter bytes

Byte 0,4,8,12 Settings Channel 0,1,2,3

[41] "Line breakage" <2mA or "Lower threshold undershot" < 4mA



Byte (2,3),(6,7),(10,11),(14,15) Channel (0,1,2,3) : Delta

Data type	Unsigned16
Admissible values	0..32767

Unused channels should be disabled in order to optimize cycle time.

[42] Diagnostic information of the corresponding channel.

6.5.9 AI4 E 4xM12 (I) – Art.Nr. 56731

6.5.9.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
AI4 E 4xM12 (I)	56731	4 Words	-	42_{hex} 43_{hex} DD_{hex} $9B_{hex}$

6.5.9.2 I/O data

6.5.9.2.1. Input data IDM

Word	0		1		2		3	
Byte	0	1	2	3	4	5	6	7
Measuring value	Channel 0		Channel 1		Channel 2		Channel 3	

6.5.9.2.2. Byte sequence High/Low - Motorola (Standard setting)

Byte	Byte 0 (High-Byte)								Byte 1 (Low-Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	0	2^{14}	2^{13}	2^{12}	2^{11}	2^{10}	2^{9}	2^{8}	2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}

6.5.9.2.3. Byte sequence Low/High – Intel

Byte	Byte 0 (Low-Byte)								Byte 1 (High-Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}	0	2^{14}	2^{13}	2^{12}	2^{11}	2^{10}	2^{9}	2^{8}

6.5.9.2.4. Representation of Analog Values

Measuring range	*Measuring value*			Range	Diagnostics
0...20 mA	**decimal**	**hexadecimal**	**binary**		
> 20	32767	7FFF	0111 1111 1111 1111	Overshooting	yes
20	32767	7FFF	0111 1111 1111 1111	Nominal range	
10	16383	3FFF	0011 1111 1111 1111		
0	0	0	0000 0000 0000 0000		
< 0	0	0	0000 0000 0000 0000	Undershooting	no
4...20 mA					
> 20	32767	7FFF	0111 1111 1111 1111	Overshooting	yes
20	32767	7FFF	0111 1111 1111 1111	Nominal range	
12	16383	3FFF	0011 1111 1111 1111		
4	0	0	0000 0000 0000 0000		
2…4	0	0	0000 0000 0000 0000	Undershooting	yes
< 2	32767	7FFF	0111 1111 1111 1111	Line break	yes

The overshoot/undershoot range is variable. When the overshoot limit setting is reached, a 0x7FFF message is sent (parameter > 20mA). A zero is generated below the undershoot limit. If the overshoot limit below 20 mA is reached, the value remains at the overshoot limit. If there is a line break, the finel value is generated (0x7FFF).

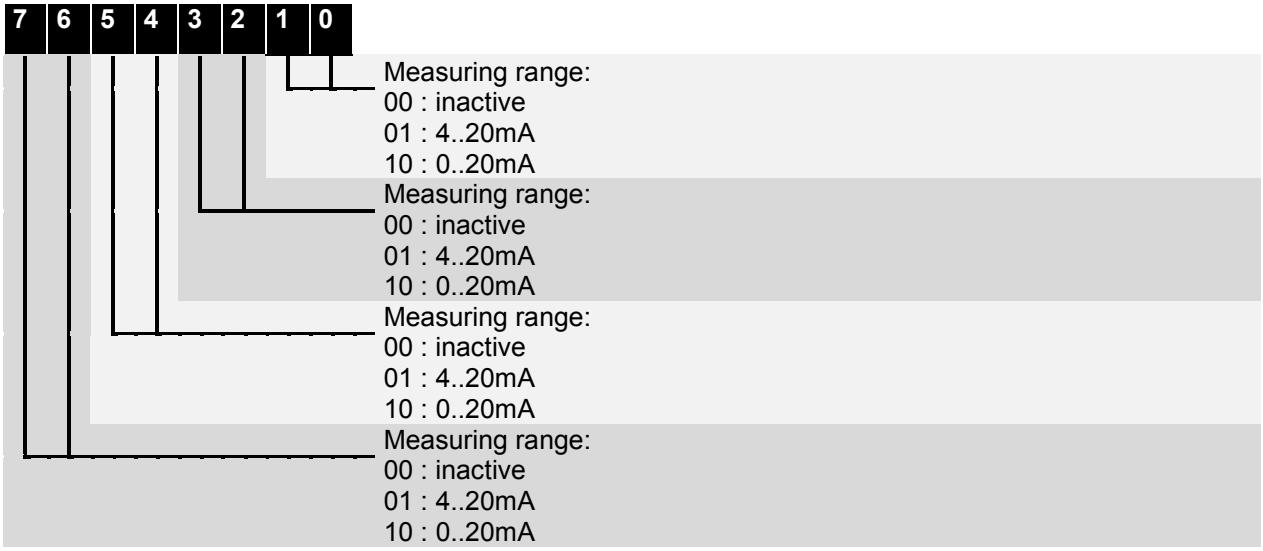
6.5.9.3 Parameter bytes

Byte	Signification
0	Settings Channel 0 …3
1	Settings module diagnostics and byte change
2	Selection filter Channel 0, settings of smoothing and diagnostics channel 0
3	Selection filter Channel 1, settings of smoothing and diagnostics channel 1
4	Selection filter Channel 2, settings of smoothing and diagnostics channel 2
5	Selection filter Channel 3, settings of smoothing and diagnostics channel 3
6	Limit undershooting 0...20mA channel 0
7	Limit undershooting 0...20mA channel 1
8	Limit undershooting 0...20mA channel 2
9	Limit undershooting 0...20mA channel 3
10	Limit overshooting channel 0
11	Limit overshooting channel 1
12	Limit overshooting channel 2
13	Limit overshooting channel 3
14	Limit undershooting 4...20mA channel 0
15	Limit undershooting 4...20mA channel 1
16	Limit undershooting 4...20mA channel 2
17	Limit undershooting 4...20mA channel 3

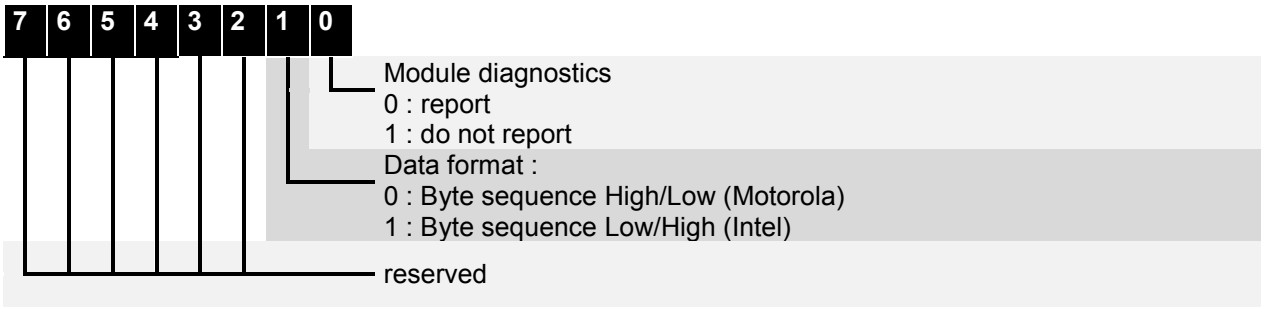
See also "Application adjustable values for overshoot and undershoot".

6.5.9.4 Bit assignment of parameter bytes

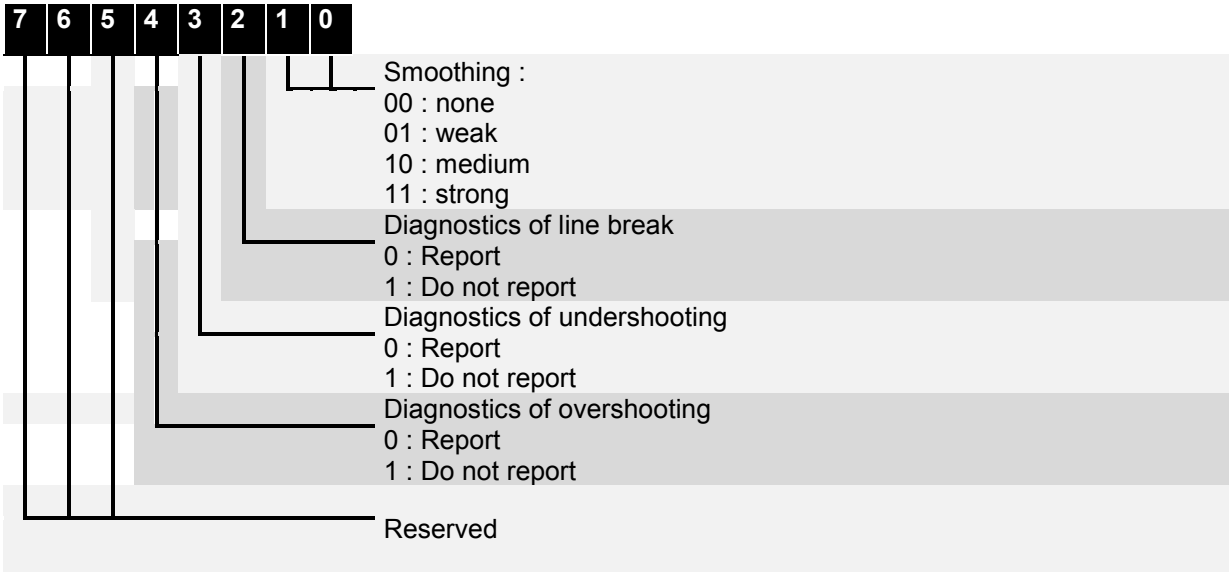
Byte 0 **Settings Channel 0,1,2,3**



Byte 1 **Settings of all mdule diagnostics / Byte format**


7 6 5 4 3 2 1 0
Module diagnostics
0 : report
1 : do not report
Data format :
0 : Byte sequence High/Low (Motorola)
1 : Byte sequence Low/High (Intel)
reserved

Byte 2 … 5 **Settings of smoothing and diagnostics channel 0 bis 3**



Byte 6 to 9 **Settings of undershooting Channel 0 bis 3 bei 0 … 20mA**

Data type	**Unsigned8**
Permitted values	**0..230**

Byte 10 to 13 **Settings of overshooting Channel 0 bis 3 bei 0 … 20mA**

Data type	**Unsigned8**
Permitted values	**0..230**

Byte 14 to 17 **Settings of undershooting Channel 0 bis 3 bei 4 … 20mA**

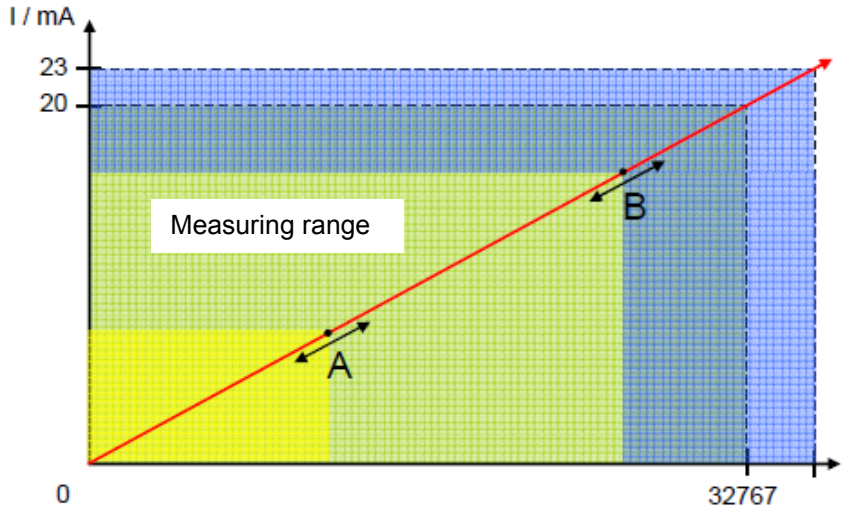
Data type	**Unsigned8**
Permitted values	**20..230**

The current value is indicated with one decimal place. The value 230 corresponds to 23.0mA, the value 40 to 4.0 mA.

Unused channels should be disabled in order to optimize cycle time.

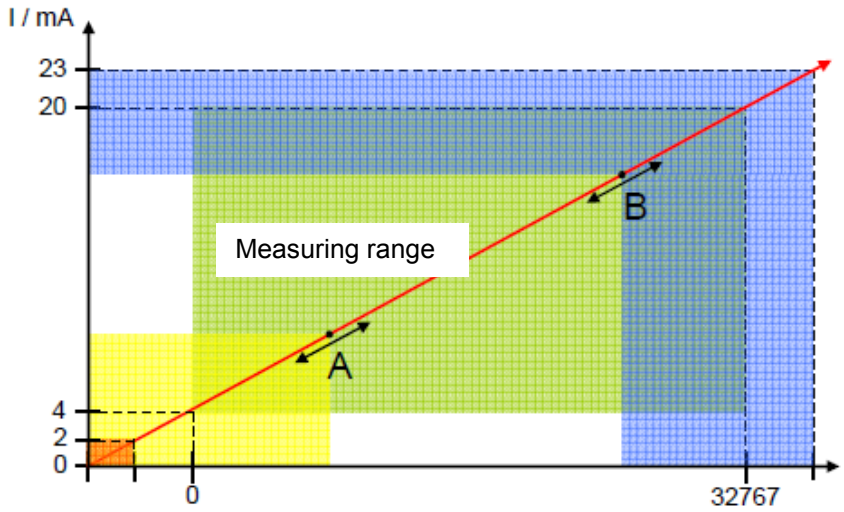
6.5.9.5 Application adjustable values for overshoot and undershoot

Operation mode 0 to 20mA



- Threshold value for undershoot (A) parameterizable from 0 to 23mA
- Threshold value for overshoot (B) parameterizable from 0 to 23mA
- If A is > B, bus diagnostics are made (parameter error) and the diagnostic LED on the associated port lights up.

Operation mode 4 to 20mA



- If current value is < 2 mA the module reports diagnostics of line break.
- Threshold value for undershoot (A) parameterizable from 0 to 23mA
- Threshold value for overshoot (B) parameterizable from 0 to 23mA
- If A is > B, bus diagnostics are made (parameter error) and the diagnostic LED on the associated port lights up.

6.5.10 AI4 C 4xM12 RTD – Art.No. 56740, AI4 C 4xM12 RTD VA– Art.No. 5674050

6.5.10.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
AI4 C 4xM12 RTD	56740	4 Words	-	42_{hex} 43_{hex} DD_{hex} $A4_{hex}$
AI4 C 4xM12 RTD VA	5674050	4 Words	-	42_{hex} 43_{hex} DD_{hex} $A4_{hex}$

6.5.10.2 I/O Data

6.5.10.2.1. Input Data IDM

Word	0		1		2		3	
Byte	0	1	2	3	4	5	6	7
Measuring value	Channel 0		Channel 1		Channel 2		Channel 3	

6.5.10.2.2. Byte sequence High/Low - Motorola (Standard setting)

Byte	Byte 0 (High-Byte)								Byte 1 (Low-Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	VZ	214	213	212	211	210	29	28	27	26	25	24	23	22	21	20

6.5.10.2.3. Byte sequence Low/High - Intel

Byte	Byte 0 (Low-Byte)								Byte 1 (High-Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	27	26	25	24	23	22	21	20	VZ	214	213	212	211	210	29	28

6.5.11 AI4 E 4xM12 RTD – Art.Nr. 56741

6.5.11.1 Identification

Description	Art.No.	Prozcess data		Identification
		Input	Output	
AI4 E 4xM12 RTD	56741	4 Words	-	42_{hex} 43_{hex} DD_{hex} $A5_{hex}$

6.5.11.2 I/O Data

6.5.11.2.1. Input Data IDM

Word	0		1		2		3	
Byte	0	1	2	3	4	5	6	7
Measuring value	Channel 0		Channel 1		Channel 2		Channel 3	

6.5.11.2.2. Byte sequence High/Low - Motorola (Standard setting)

Byte	Byte 0 (High-Byte)								Byte 1 (Low-Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Measuring value	VZ	2^{14}	2^{13}	2^{12}	2^{11}	2^{10}	2^{9}	2^{8}	2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}

6.5.11.2.3. Byte sequence Low/High - Intel

Byte	Byte 0 (Low-Byte)								Byte 1 (High-Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Measuring value	2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}	VZ	2^{14}	2^{13}	2^{12}	2^{11}	2^{10}	2^{9}	2^{8}

6.5.11.2.4. Representation of Analog Values

Resistance test:

Range	Units		Measuring range 0...3000 Ohm	Diagnostic
	hexadecimal	decimal		
Overflow	7FFF	32767	>3251,2	Wire break
	>7530	>30000	3000<R<3251,2	Upper limit
Nominal range	7530 5100 0	30000 20736 0	3000 2073.6 0	_
Underflow	<0	<0	<0	Yes

Platinum Standard:

Range 0.1°C	Units		Tempera-ture in °C	Units		Tempera-ture in °F	Diagnostic
	Hexa-decimal	decimal		Hexa-decimal	decimal		
Overflow	7FFF	32767	>1800	7FFF	32767	>3272	Wire break
	>2134	>8500	850<T<1800	>3D04	>15620	1562<T<3272	Upper limit
Nominal range	2134 0 F830	8500 0 -2000	850 0 -200	3D04 0 F330	15620 0 -3280	1562 0 -328	_
Underflow	<F830	<-2000	<-200	<F330	<-3280	<-328	Yes

Nickel Standard:

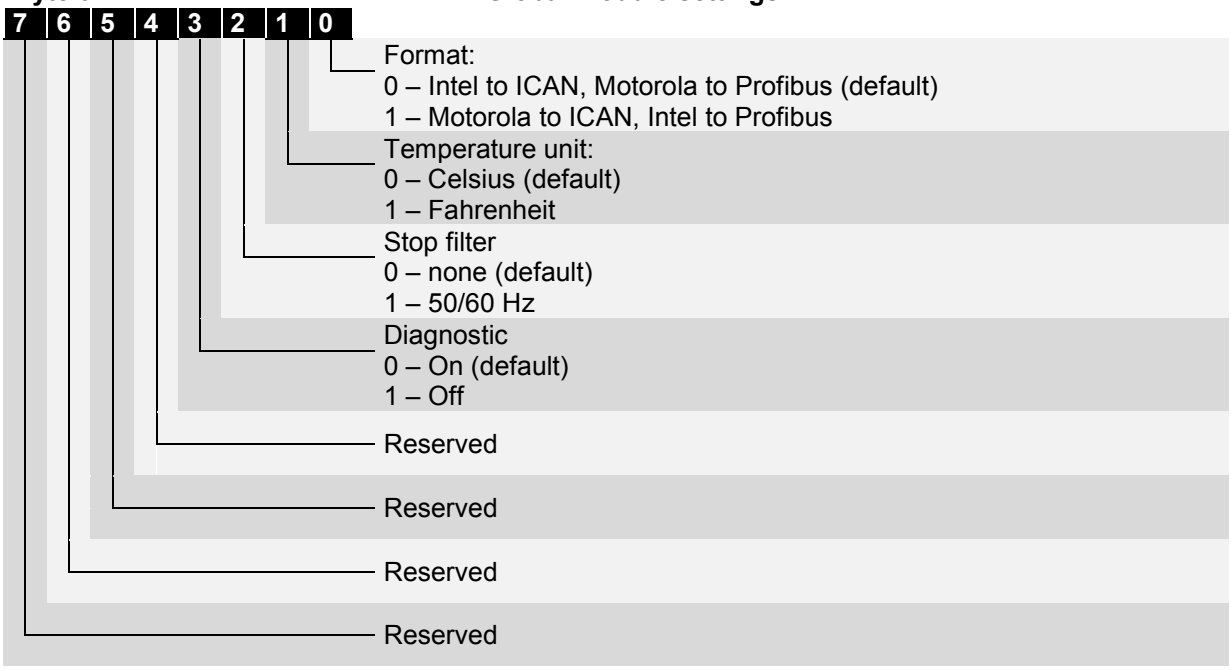
Range 0,1°C	Units		Tempera-ture in °C	Units		Tempera-ture in °F	Diagnostic
	Hexa-decimal	decimal		Hexa-decimal	decimal		
Overflow	7FFF	32767	>1800	7FFF	32767	>3272	Wire break
	>9C4	>2500	250<T<1800	>12D4	>4820	482<T<3272	Upper limit
Nominal range	9C4 0 FDA8	2500 0 -600	250 0 -60	2134 0 FD08	4820 0 -760	482 0 -76	_
Underflow	<FDA8	<-600	<-60	<FD08	<-760	<-76	Yes

6.5.11.3 Parameter bytes

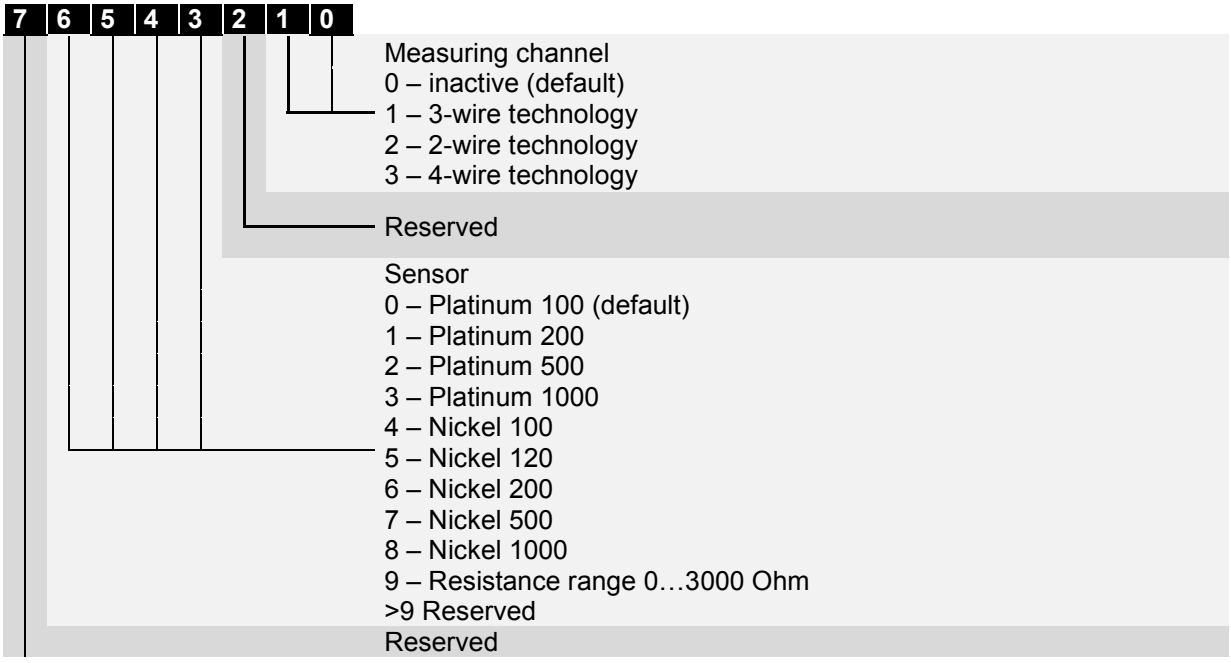
Byte	Signification
0	Global modul settings
1	Settings Channel 0
2	Settings Channel 1
3	Settings Channel 2
4	Settings Channel 3

6.5.11.4 Bit assignment of parameter bytes

Byte 0: **Global module settings**

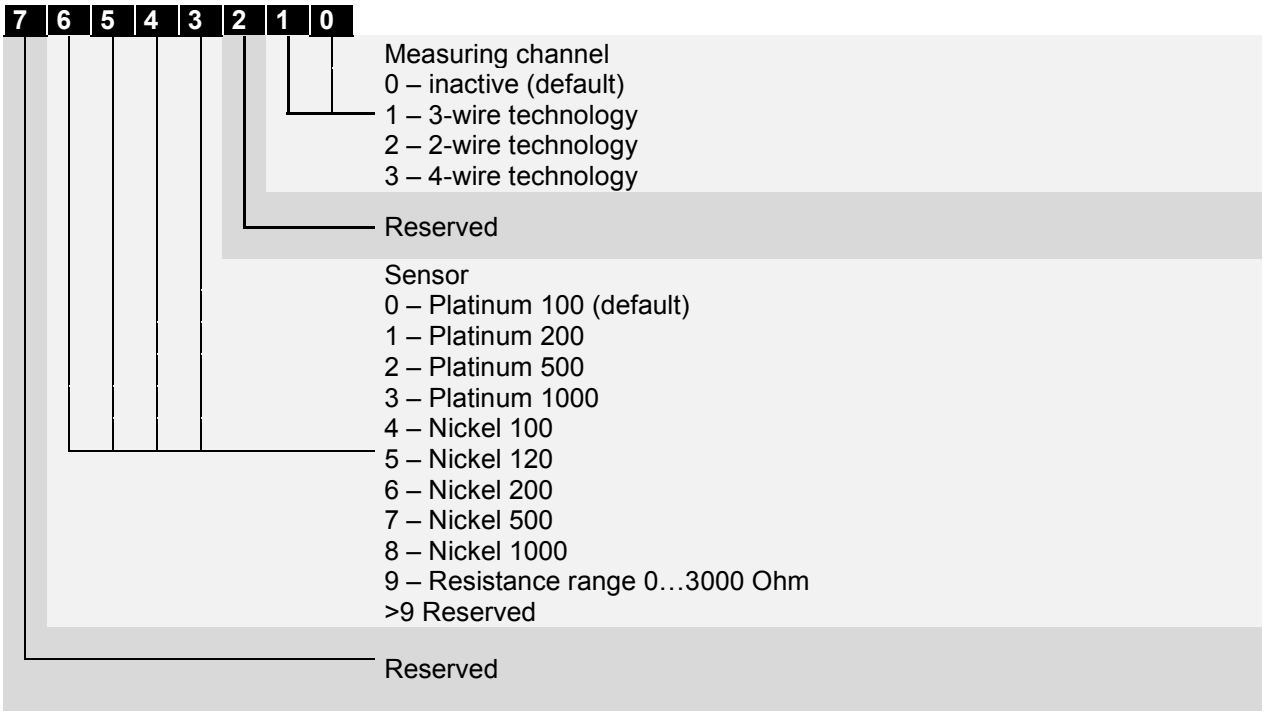


Byte 1, 2, 3, 4: **measurement settings channel 0, 1, 2, 3**



Unused channels should be disabled in order to optimize cycle time.

Byte 1, 2, 3, 4: **measurement settings channel 0, 1, 2, 3**



Unused channels should be disabled in order to optimize cycle time.

6.5.12 AI4 C 4xM12 TH – Art.No. 56748, AI4 C 4xM12 TH VA – Art.No. 5674850

6.5.12.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
AI4 C 4xM12 TH	56748	4 Words	-	$42_{hex}43_{hex}$DDhexaC
AI4 C 4xM12 TH VA	5674850	4 Words	-	$42_{hex}43_{hex}$DDhexaC

6.5.12.2 I/O Data

6.5.12.2.1. Input Data IDM

Word	0		1		2		3	
Byte	0	1	2	3	4	5	6	7
Measuring value	Channel 0		Channel 1		Channel 2		Channel 3	

6.5.12.2.2. Byte sequence High/Low - Motorola (Standard setting)

Byte	Byte 0 (High-Byte)								Byte 1 (Low-Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	VZ	214	213	212	211	210	29	28	27	26	25	24	23	22	21	20

6.5.12.2.3. Byte sequence Low/High - Intel

Byte	Byte 0 (Low-Byte)								Byte 1 (High-Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	27	26	25	24	23	22	21	20	VZ	214	213	212	211	210	29	28

6.5.12.2.4. Representation of analog values

Sensor Type K:

Range 0,1°C	Units		Temperature in °C	Units		Temperature in °F	Diagnostic
	hexade-cimal	decimal		hexade-cimal	decimal		
Overflow	7FFF	32767	>2000	7FFF	32767	>3272	Wire break
	>3598	>13720	1372<T<2000	>6098	>24728	2473<T<3272	Upper limit
Nominal range	3598 0 F830	13720 0 -2000	1372 0 -200	6098 0 F330	24728 0 -3280	2473 0 -328	–
Underflow	<F830	<-2000	<-200	<F330	<-3280	<-328	Yes

Sensor Type N:

Range 0,1°C	Units		Temperature in °C	Units		Temperature in °F	Diagnostic
	hexade-cimal	decimal		hexade-cimal	decimal		
Overflow	7FFF	32767	>2000	7FFF	32767	>3272	Wire break
	>32C8	>13000	1300<T<2000	>5B88	>23432	2343<T<2473	Upper limit
Nominal range	35C8 0 F830	13000 0 -2000	1300 0 -200	5B88 0 F330	23432 0 -3280	2343 0 -328	–
Underflow	<F830	<-2000	<-200	<F330	<-3280	<-328	Yes

Sensor Type J:

Range 0,1°C	Units		Temperature in °C	Units		Temperature in °F	Diagnostic
	hexade-cimal	decimal		hexade-cimal	decimal		
Overflow	7FFF	32767	>2000	7FFF	32767	>3272	Wire break
	>2EE0	>12000	1200<T<2000	>5480	>21632	2163<T<2473	Upper limit
Nominal range	2EE0 0 F830	12000 0 -2000	1200 0 -200	5480 0 F330	21632 0 -3280	2163 0 -328	–
Underflow	<F830	<-2000	<-200	<F330	<-3280	<-328	Yes

Sensor Type E:

Range 0,1°C	Units		Temperature in °C	Units		Temperature in °F	Diagnostic
	hexade-cimal	decimal		hexade-cimal	decimal		
Overflow	7FFF	32767	>2000	7FFF	32767	>3272	Wire break
	>2710	>10000	1000<T<2000	>4670	>18032	1803<T<2473	Upper limit
Nominal range	2710 0 F830	10000 0 -2000	1000 0 -200	6098 0 F330	24728 0 -3280	1803 0 -328	–
Underflow	<F830	<-2000	<-200	<F330	<-3280	<-328	Yes

Sensor Type R:

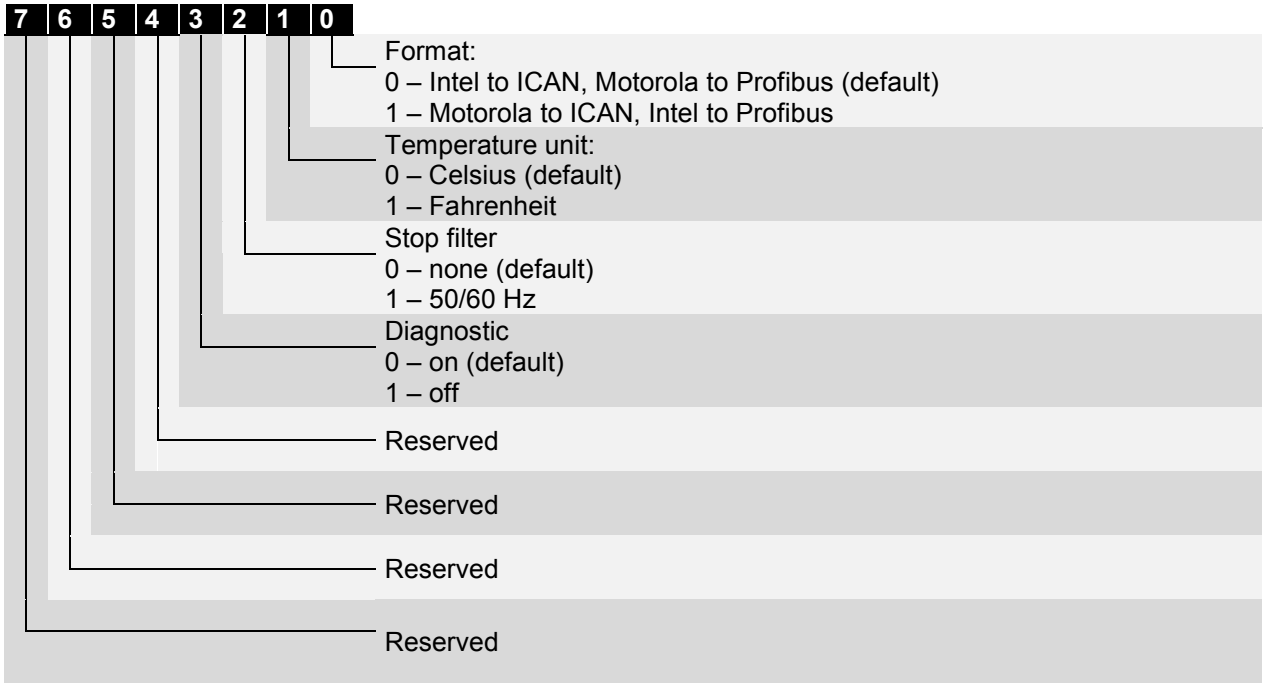
Range 0,1°C	Units		Temperature in °C	Units		Temperature in °F	Diagnostic
	hexade-cimal	decimal		hexade-cimal	decimal		
Overflow	7FFF	32767	>2000	7FFF	32767	>3272	Wire break
	>4510	>17680	1768<T<2000	>7D8C	>32140	3214<T<3272	Upper limit
Nominal range	4510 0 FDB2	17680 0 -500	250 0 -50	7D8C 0 FC5C	32140 0 -932	3214 0 -93	–
Underflow	<FD B2	<-500	<-50	<FC5C	<-932	<-93	Yes

6.5.12.3 Parameter bytes

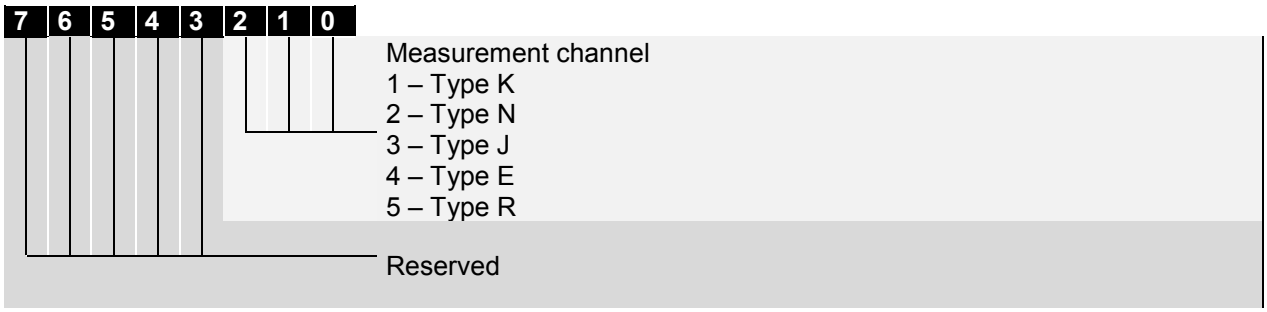
Byte	Signification
0	global module settings
1	measurement settings channel 0
2	measurement settings channel 1
3	measurement settings channel 2
4	measurement settings channel 3

6.5.12.4 Bit assignment of parameter bytes

Byte 0: Global module settings



Byte 1, 2, 3, 4: measurement settings channel 0, 1, 2, 3



Unused channels should be disabled in order to optimize cycle time.

6.5.13 AI4 E 4xM12 TH – Art.Nr. 56749

6.5.13.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
AI4 E 4xM12 TH	56749	4 Words	-	42hex43hexDDhexAD

6.5.13.2 I/O Data

6.5.13.2.1. Input Data IDM

Word	0		1		2		3	
Byte	0	1	2	3	4	5	6	7
Measuring value	Channel 0		Channel 1		Channel 2		Channel 3	

6.5.13.2.2. Byte sequence High/Low - Motorola (Standard setting)

Byte	Byte 0 (High-Byte)								Byte 1 (Low-Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	VZ	2^{14}	2^{13}	2^{12}	2^{11}	2^{10}	2^{9}	2^{8}	2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}

6.5.13.2.3. Byte sequence Low/High - Intel

Byte	Byte 0 (Low-Byte)								Byte 1 (High-Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}	VZ	2^{14}	2^{13}	2^{12}	2^{11}	2^{10}	2^{9}	2^{8}

6.5.13.2.4. Representation of analog values

Sensor Type K:

Range 0,1°C	Units		Temperature in °C	Units		Temperature in °F	Diagnostic
	hexade-cimal	decimal		hexade-cimal	decimal		
Overflow	7FFF	32767	>2000	7FFF	32767	>3272	Wire break
	>3598	>13720	1372<T<2000	>6098	>24728	2473<T<3272	Upper limit
Nominal range	3598 0 F830	13720 0 -2000	1372 0 -200	6098 0 F330	24728 0 -3280	2473 0 -328	_
Underflow	<F830	<-2000	<-200	<F330	<-3280	<-328	Yes

Sensor Type N:

Range 0,1°C	Units		Temperature in °C	Units		Temperature in °F	Diagnostic
	hexade-cimal	decimal		hexade-cimal	decimal		
Overflow	7FFF	32767	>2000	7FFF	32767	>3272	Wire break
	>32C8	>13000	1300<T<2000	>5B88	>23432	2343<T<2473	Upper limit
Nominal range	35C8 0 F830	13000 0 -2000	1300 0 -200	5B88 0 F330	23432 0 -3280	2343 0 -328	_
Underflow	<F830	<-2000	<-200	<F330	<-3280	<-328	Yes

Sensor Type J:

Range 0,1°C	Units		Temperature in °C	Units		Temperature in °F	Diagnostic
	hexade-cimal	decimal		hexade-cimal	decimal		
Overflow	7FFF	32767	>2000	7FFF	32767	>3272	Wire break
	>2EE0	>12000	1200<T<2000	>5480	>21632	2163<T<2473	Upper limit
Nominal range	2EE0 0 F830	12000 0 -2000	1200 0 -200	5480 0 F330	21632 0 -3280	2163 0 -328	_
Underflow	<F830	<-2000	<-200	<F330	<-3280	<-328	Yes

Sensor Type E:

Range 0,1°C	Units		Temperature in °C	Units		Temperature in °F	Diagnostic
	hexade-cimal	decimal		hexade-cimal	decimal		
Overflow	7FFF	32767	>2000	7FFF	32767	>3272	Wire break
	>2710	>10000	1000<T<2000	>4670	>18032	1803<T<2473	Upper limit
Nominal range	2710 0 F830	10000 0 -2000	1000 0 -200	6098 0 F330	24728 0 -3280	1803 0 -328	–
Underflow	<F830	<-2000	<-200	<F330	<-3280	<-328	Yes

Sensor Type R:

Range 0,1°C	Units		Temperature in °C	Units		Temperature in °F	Diagnostic
	hexade-cimal	decimal		hexade-cimal	decimal		
Overflow	7FFF	32767	>2000	7FFF	32767	>3272	Wire break
	>4510	>17680	1768<T<2000	>7D8C	>32140	3214<T<3272	Upper limit
Nominal range	4510 0 FDB2	17680 0 -500	250 0 -50	7D8C 0 FC5C	32140 0 -932	3214 0 -93	–
Underflow	<FD B2	<-500	<-50	<FC5C	<-932	<-93	Yes

6.5.13.3 Parameter bytes

Byte	Signification
0	global module settings
1	measurement settings channel 0
2	measurement settings channel 1
3	measurement settings channel 2
4	measurement settings channel 3

6.5.13.4 Bit assignment of parameter bytes

Byte 0: Global module settings

7	6	5	4	3	2	1	0

Format:
0 – Intel to ICAN, Motorola to Profibus (default)
1 – Motorola to ICAN, Intel to Profibus

Temperature unit:
0 – Celsius (default)
1 – Fahrenheit

Stop filter
0 – none (default)
1 – 50/60 Hz

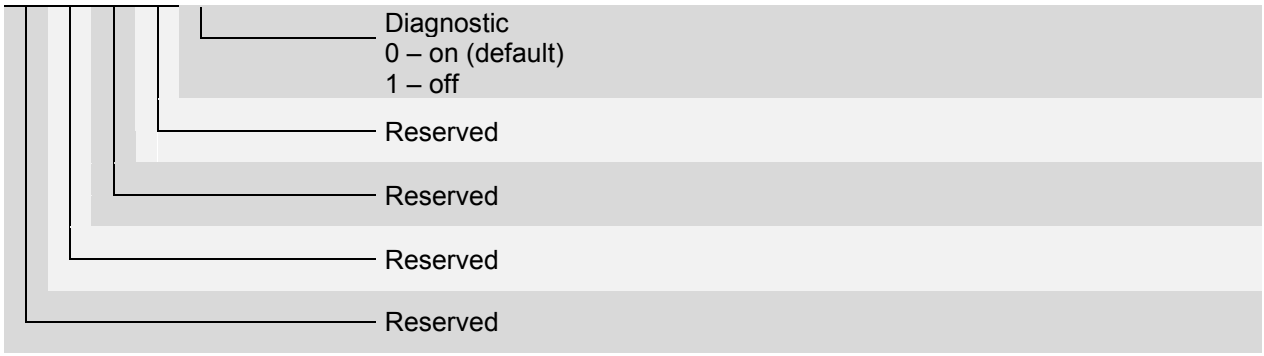


Fig. 58: Bit assignment of byte 0

Byte 1, 2, 3, 4: **measurement settings channel 0, 1, 2, 3**

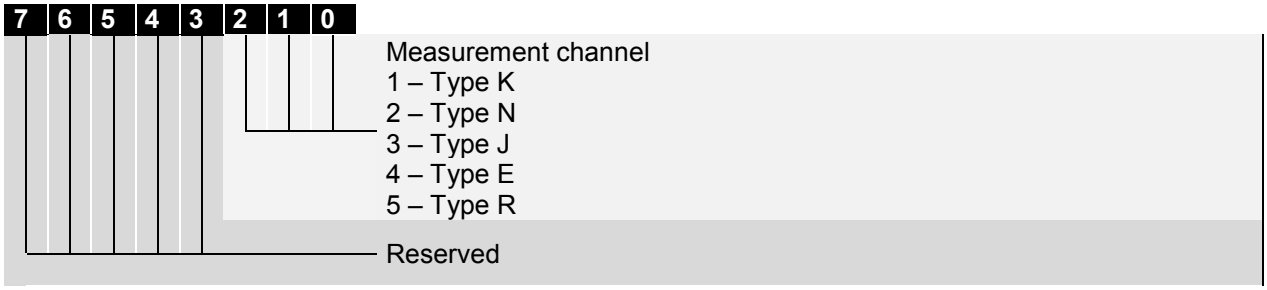


Fig. 59: Bit assignment of byte 1, 2, 3, 4

Unused channels should be disabled in order to optimize cycle time.

6.6 Function Modules

6.6.1 CNT2 C 4xM12 – Art.No. 56750

A protocol integrated in the module CNT2 C 4xM12 – Art. no. 56750 makes it possible to read or write data from the module or to perform services in a cyclic data transfer.

- Read-out the software version.
- Alternative access to counter, comparative value, and parameter.
- Parameter change.

Please check our homepage for a software library for the control used.

6.6.1.1 Identification

Description	Art.Nr.	Process data		Identification
		Input	Ausgang	
CNT2 C 4xM12	56750	8 Byte	8 Byte	C2 $_{hex}$07$_{hex}$07$_{hex}$DD hexaE

6.6.1.2 I/O Data

6.6.1.2.1. Input Data IDM

Byte	0	1	2	3	4	5	6	7
Meßwert	Stat_0	Stat_1	CD32I Status	CD32I Index	CD32I Data3	CD32I Data2	CD32I Data1	CD32I Data0

Bit assignment Byte Stat_0 :

Bit	Name	Signification
0	Status_0	Comparative value Counter 0 reached/not reached Status_0 is set when the comparative value is reached. Status_0 is reset when RESET_0 is set
1	GATE_0	Status Input Counter 0 GATE_0 release or block counter.
2	UPDOWN_0	Status counting direction Counter 0
3	DO_0	Status output DO_0 DO_0 status of digital output 0
4 … 7	-	Reserved

Bit assignment Byte Stat_1 :

Bit	Name	Signification
0	Status_1	Comparative value Counter 1 reached/not reached. Status_1 is set when the comparative value is reached. Status_1 is reset when RESET_1 is set
1	GATE_1	Status Input Counter 1 GATE_1 realease or block counter
2	UPDOWN_1	Status Counting direction Counter 1
3	DO_1	Status output DO_1 DO_1 Status of digital output 1
4 … 7	-	Reserved

Chapter 6.6.1.3 and 7 "Communication Driver" describes access and signification of the IDM bytes 2 to 7.

6.6.1.2.2. Output Data ODM

Byte	0	1	2	3	4	5	6	7
Measuring value	Ctrl_0	Ctrl_1	CD32O Ctrl	CD32O Index	CD32O Data3	CD32O Data2	CD32O Data1	CD32O Data0

Bit assignment Byte Ctrl_0 :

Bit	Name	Signification
0	Gate 0	Activate counter Gate 0 set, counter can start
1	RESET_0	Reset counter 0 to initial value (0000_{hex})
2	DO_0	If 1, switch off or reset output 0
3	Up/Down_0	0 – process controlled, 1- down PLC controlled
4 … 7	-	Reserved

Bitbelegung Byte Ctrl_1 :

Bit	Name	Signification
0	Gate 1	Activate counter Gate 1 set, counter can start
1	RESET_1	Reset counter 1 to initial value (0000_{hex})
2	DO_1	If 1, switch off or reset output 1
3	Up/Down_1	0 – process controlled, 1- down PLC controlled
4 … 7	-	Reserved

Chapter 6.6.1.3 and 7 "Communication Driver" describes access and signification of the IDM bytes 2 to 7.

Behavior of the gate signal:

Gate	Control	Process	
	0	0	Counter blocked
	1	0	Counter released
	1	1	Counter released
	0	1	Counter released

Behavior of the Up/Down Signal:

Up/Down	Control	Prozess	
	0	0	Counting direction up
	1	0	Counting direction down
	1	1	Counting direction down
	0	1	Counting direction down

Counter and corresponding outputs operate independently of each other.When the comparative value is reached, counter and corresponding output must both be reset. If only the counter is reset, the corresponding output would remain as it is.

6.6.1.3 Comunications Driver

The following access codes are written in the CTRL output data (Byte 2).

Decimal values for the control byte:

	Write access	Read access
Byte	192	128
Double word	224	160

The following tables show the corresponding index (Byte 3) for input and output data:

Index	Access	Designation	Value	Description
0	Write	Control	0	
1	Read	Status	0	
2	Read	MAX_WR_ADR	28	
3	Read	MAX_RD_ADR	28	
4	Write	PWD_HIGH	0	
5	Write	PWD_LOW	0	
6	Read	Version	0	SW version
7	Read	Version	1	
8	Read	cValue0	0	Counter 0 counter reading
9	Read		0	
10	Read		0	
11	Read		0	
12	Read	cValue1	0	Counter 1 counter reading
13	Read		0	
14	Read		0	
15	Read		0	
16	Read/Write	Parameter[0]	0	Global module settings
17	Read/Write	Parameter[1]	0	Settings Counter 0
18	Read/Write	Parameter[2]	0	Reserved
19	Read/Write	Parameter[3]	0	Comparative value Counter 0
20	Read/Write	Parameter[4]	0	
21	Read/Write	Parameter[5]	0	
22	Read/Write	Parameter[6]	0	
23	Read/Write	Parameter[7]	0	Settings Counter 1
24	Read/Write	Parameter[8]	0	Reserved
25	Read/Write	Parameter[9]	0	Comparative value Counter 1
26	Read/Write	Parameter[10]	0	
27	Read/Write	Parameter[11]	0	
28	Read/Write	Parameter[12]	0	

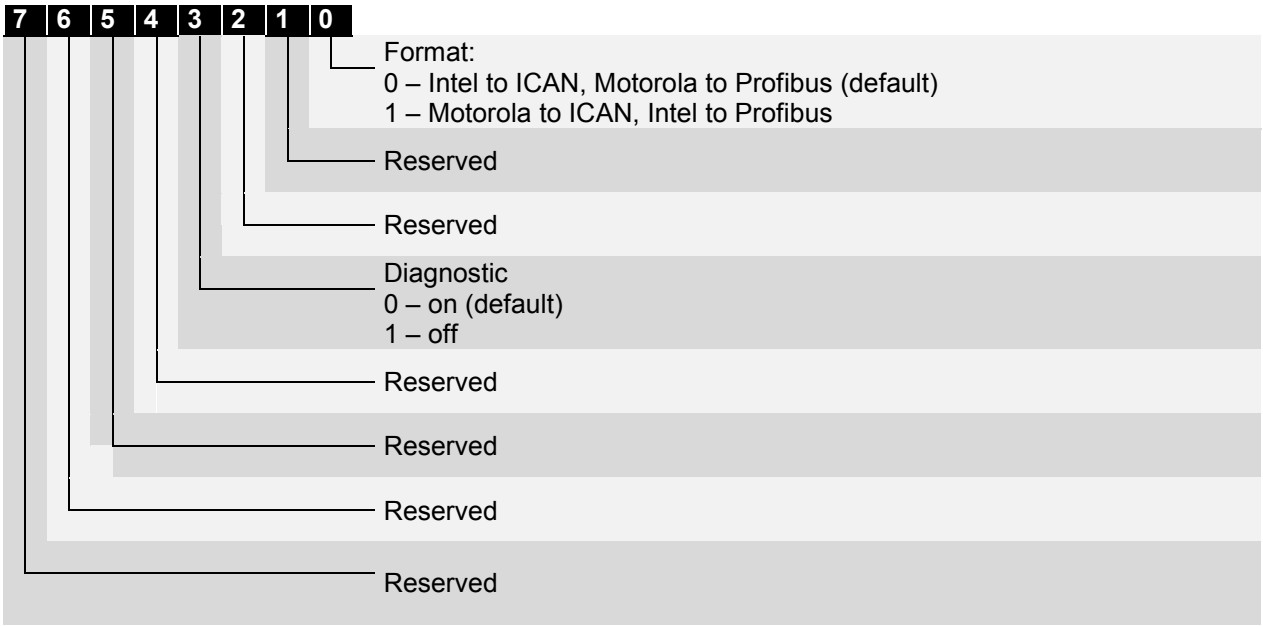
The parameters mentioned in this table are described in chapter 6.6.1.4 "Parameter bytes".

6.6.1.4 Parameter bytes

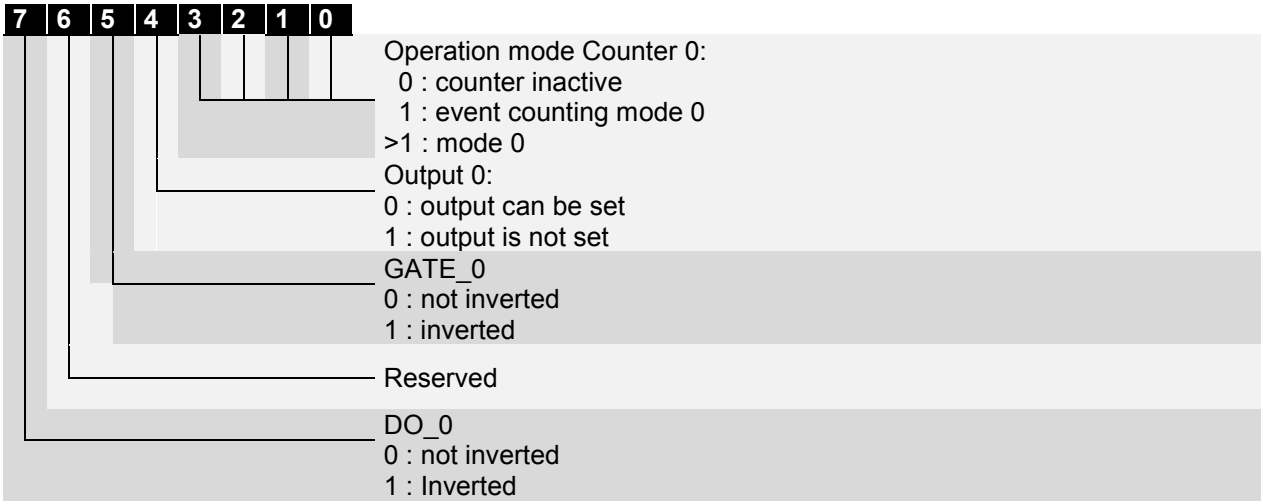
Byte	Signification
0	Globale module settings
1	Settings Counter 0
2	Reserved
3	Comparative value Channel 0
4	Comparative value Channel 0
5	Comparative value Channel 0
6	Comparative value Channel 0
7	Settings Counter 1
8	Reserved
9	Comparative value Channel 1
10	Comparative value Channel 1
11	Comparative value Channel 1
12	Comparative value Channel 1

6.6.1.5 Bit assignment of parameter bytes

Byte 0: Global module settings

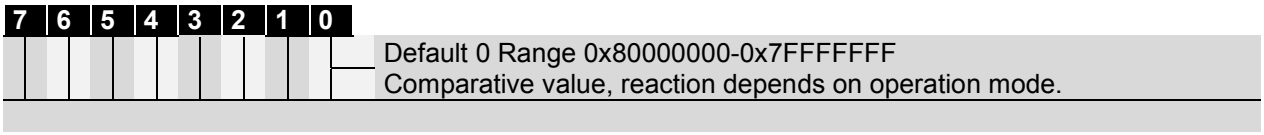


Byte 1: Settings Counter 0

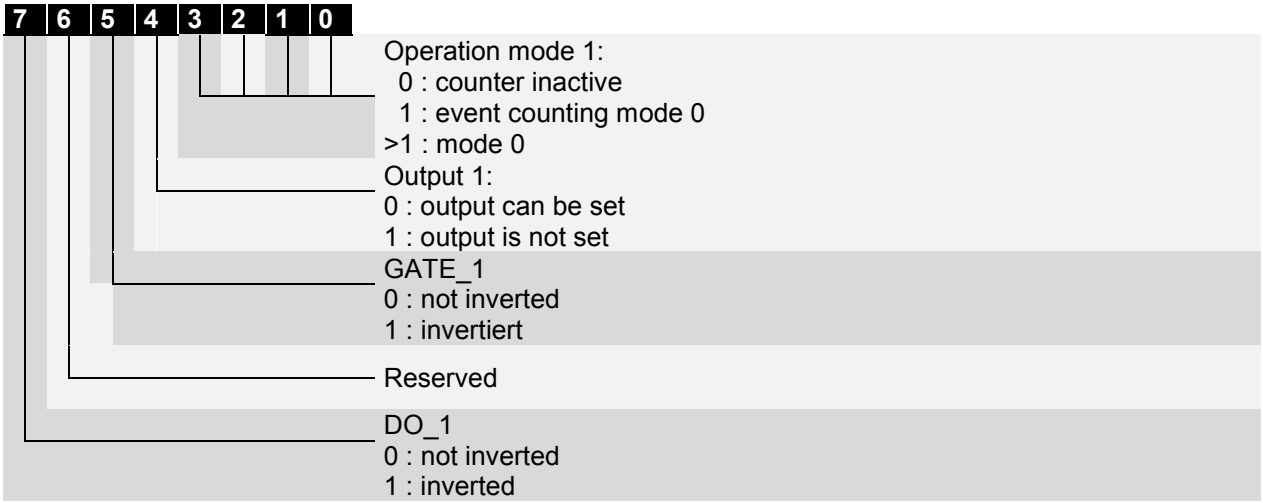


Byte 2 Reserved

Byte 3, 4, 5, 6: Comparative value Channel 0

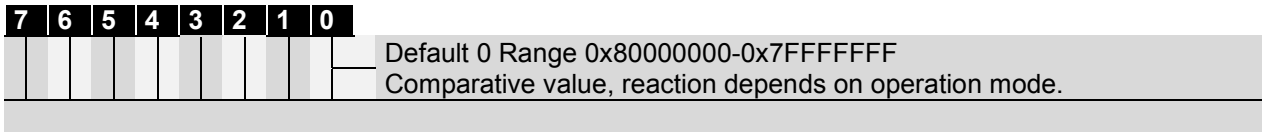


Byte 7: Settings Counter 1



Byte 8 Reserved

Byte 9, 10, 11, 12: Comparative value Channel 1



6.6.1.6 Examples

Below an example of a write and read access.

Read access to the double word counter reading:

The counter reading is a double word, therefore the access code 160 Dez "read access double word“ is described in the output data Byte 2 (CTRL).

In this example, we access the counter reading Counter_0, this is index 8.

Byte	0	1	2	3	4	5	6	7
Measuring value	Ctrl_0	Ctrl_1	Ctrl 160 Dez	Index 8 Dez	Data3 0	Data2 0	Data1 0	Data0 0

If this command is successfully executed, the following response is reported to the input data.

The counter reading in our example is 0x12345678

Byte	0	1	2	3	4	5	6	7
Measuring value	Stat_0	Stat_1	Ctrl 160 Dez	Index 8 Dez	Data3 12	Data2 34	Data1 56	Data0 78

The previous command has to be reset in order to execute another command. For this purpose a zero is entered in Byte 2 (CTRL).

Byte	0	1	2	3	4	5	6	7
Measuring value	Ctrl_0	Ctrl_1	Ctrl 0	Index 0	Data3 0	Data2 0	Data1 0	Data0 0

Write access to the double word comparative value:

The comparative value is a double word, therefore the access code 224 Dez "read access double word“ is described in the output data Byte 2 (CTRL).

In this example, we access to the comparative value Counter_1, this is Index 25, and we describe this value with 0x7FFFFFFF.

Byte	0	1	2	3	4	5	6	7
Measuring value	Ctrl_0	Ctrl_1	Ctrl 224 Dez	Index 25 Dez	Data3 7F	Data2 FF	Data1 FF	Data0 FF

The previous command has to be reset in order to execute another command. For this purpose a zero is entered in Byte 2 (CTRL).

Byte	0	1	2	3	4	5	6	7
Measuring value:	Ctrl_0	Ctrl_1	Ctrl 0	Index 0	Data3 0	Data2 0	Data1 0	Data0 0

Read/Write Access on byte value

For the byte access proceed as with the double word, only the access codes have to be adjusted.

(Write 192, Read 128). The following steps as described before.

6.6.2 DIO4 RS485 E 3xM12 – Art.Nr. 56760

6.6.2.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
DIO4 RS485 E 3xM12	56760	8 Bytes	8 Bytes	C2 07 07 DD B8

6.6.2.2 I/O – Data

6.6.2.2.1. Input Data IDM

Byte	0	1	2	3	4	5	6	7
Measuring value	Status_0	Status_1	Status_2	Data4	Data3	Data2	Data1	Data0

Bit assignment Byte Status_0 :

Bit	Name	Wert	Signification
0 bis 2	Retval	0	Request_Done
		1	Request_Done
		2	Transmit_Done
		3	Delete RX-Buffer_Done
		4	Delete TX-Buffer_Done
		5	Reset_Done
		6	-
		7	-
3	Rx		Sign in Rx-Buffer available for release
4	In00		Input Channel 00
5	In01		Input Channel 01
6	In10		Input Channel 10
7	In11		Input Channel 11

Bit assignment Byte Status_1 :

Status	Signification	
0	DataLengthRx (0 bis 5)	Length of RX data that are transmitted in the first transmit PDO max. 5 bytes
1		
2		
3	ResNb (0 bis 31)	Response number. Is incremented any time a PLC request is processed.
4		
5		
6		
7		

Bit assignment Byte Status_2 (communication status) :

Status	Description	Signification
0	TX_BUSY	Module is transmitting data
1	-	-
2	RX_WARN	Rx-Buffer 80% full
3	RX_PARITY	Parity fault during receipt
4	XOFF	XOFF was received
5	TX_OVERFLOW	Tx buffer overflow
6	RX_OVERFLOW	Rx buffer overflow
7	XOFF_TIMEOUT	No XON was received after XOFF within the parame-terized monitoring time. Send will be restarted.

6.6.2.2.2. Ausgangsdaten PAA

Byte	0	1	2	3	4	5	6	7
Measuring value	Ctrl_0	Ctrl_1	Ctrl_2	Data4	Data3	Data2	Data1	Data0

Bitbelegung Byte 0 : Ctrl_0

Bit	Name	Valuet	Signification
0 bis 2	CMD	0	Request
		1	Request
		2	Transmit
		3	Delete RX-Buffer
		4	Delete TX-Buffer
		5	Reset
		6	-
		7	-
3	-	-	-
4	Out00		Output Channel 00
5	Out01		Output Channel 01
6	Out10		Output Channel 10
7	Out11		Output Channel 11

Command	Explanation
Request	If 0->1 or 1->0 Tx and Rx data are exchanged with the buffers.
Transmit	All signs in the tx buffer are send. Tx buffer is empty.
Delete RX-Buffer	Delete Rx buffer.
Delete TX-Buffer	Delete Tx buffer. Signs are NOT sent.
Reset	Resets interface, RX and TX Buffer are deleted.

Bit assignment Byte 1 : Ctrl_1

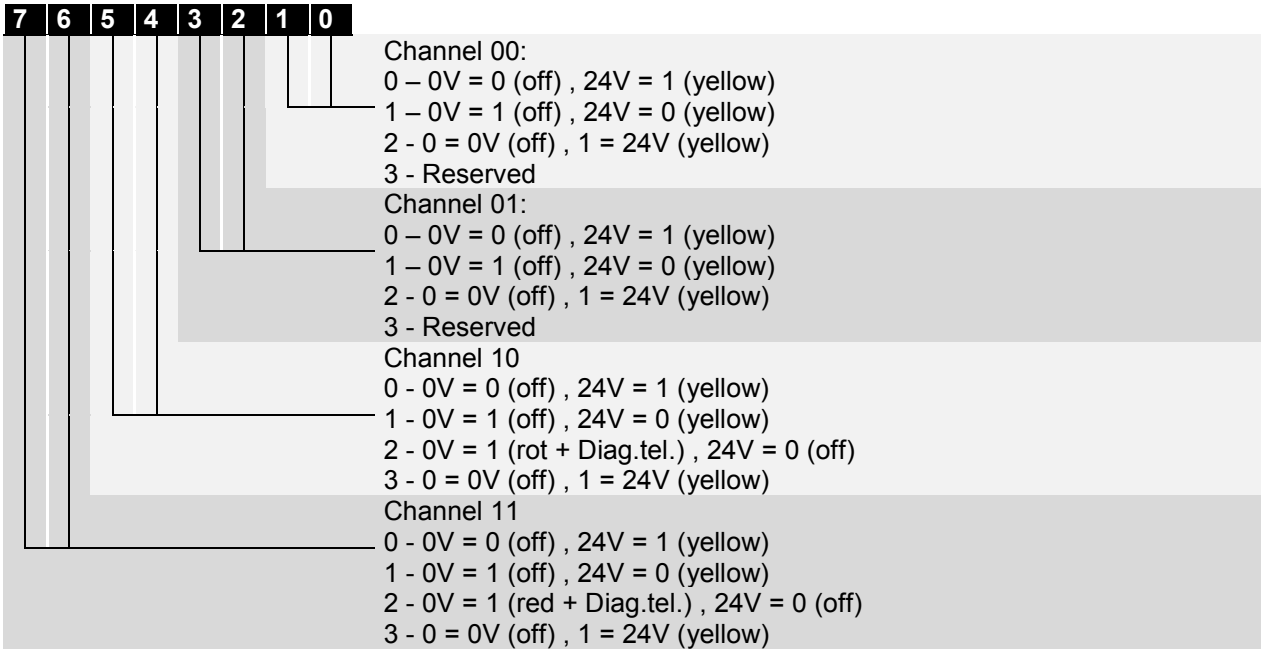
Status	Signification	
0	DataLengthTx (0 bis 5)	Length of Tx data that are stored in the Tx buffer of the module. max. 5 bytes.
1		
2		
3	Reserved	
4	Reserved	
5	Reserved	
6	Reserved	
7	Reserved	

6.6.2.3 Parameter bytes

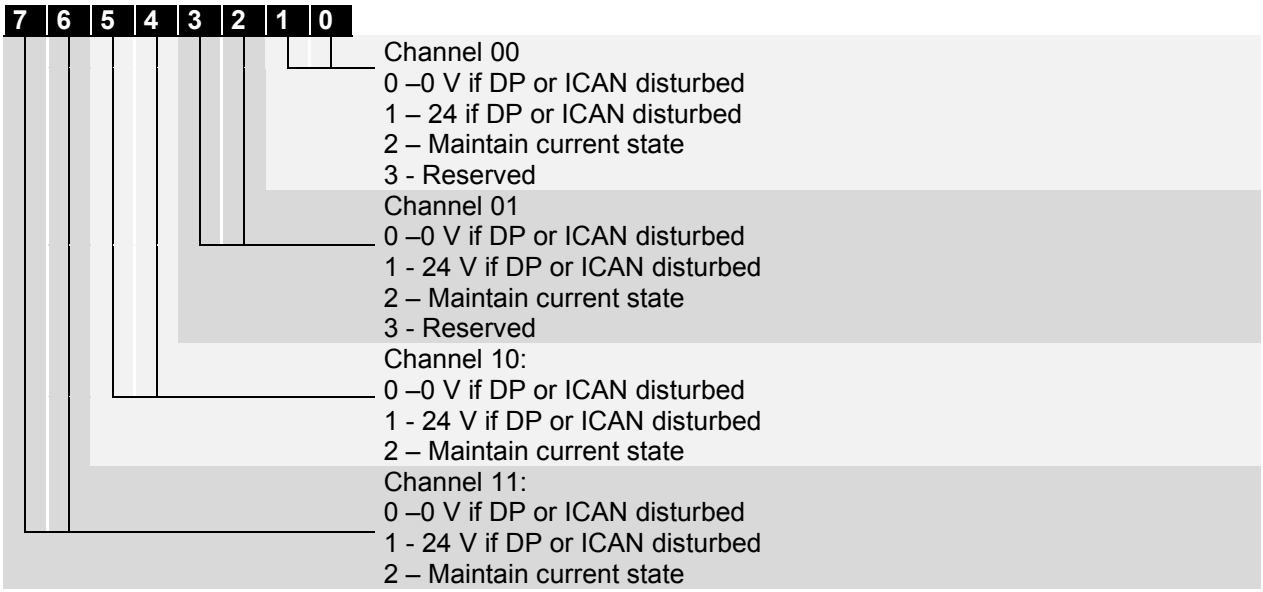
Byte	Signification
0	Function Channel 00,01,10,11 Art.-No. 56760
1	Safe status output 00,01,10,11
2	Settings RS485 Byte 0
3	Settings RS485 Byte 1
4	XOFF Timeout
5	Send delay

6.6.2.4 Bit assignment of parameter bytes

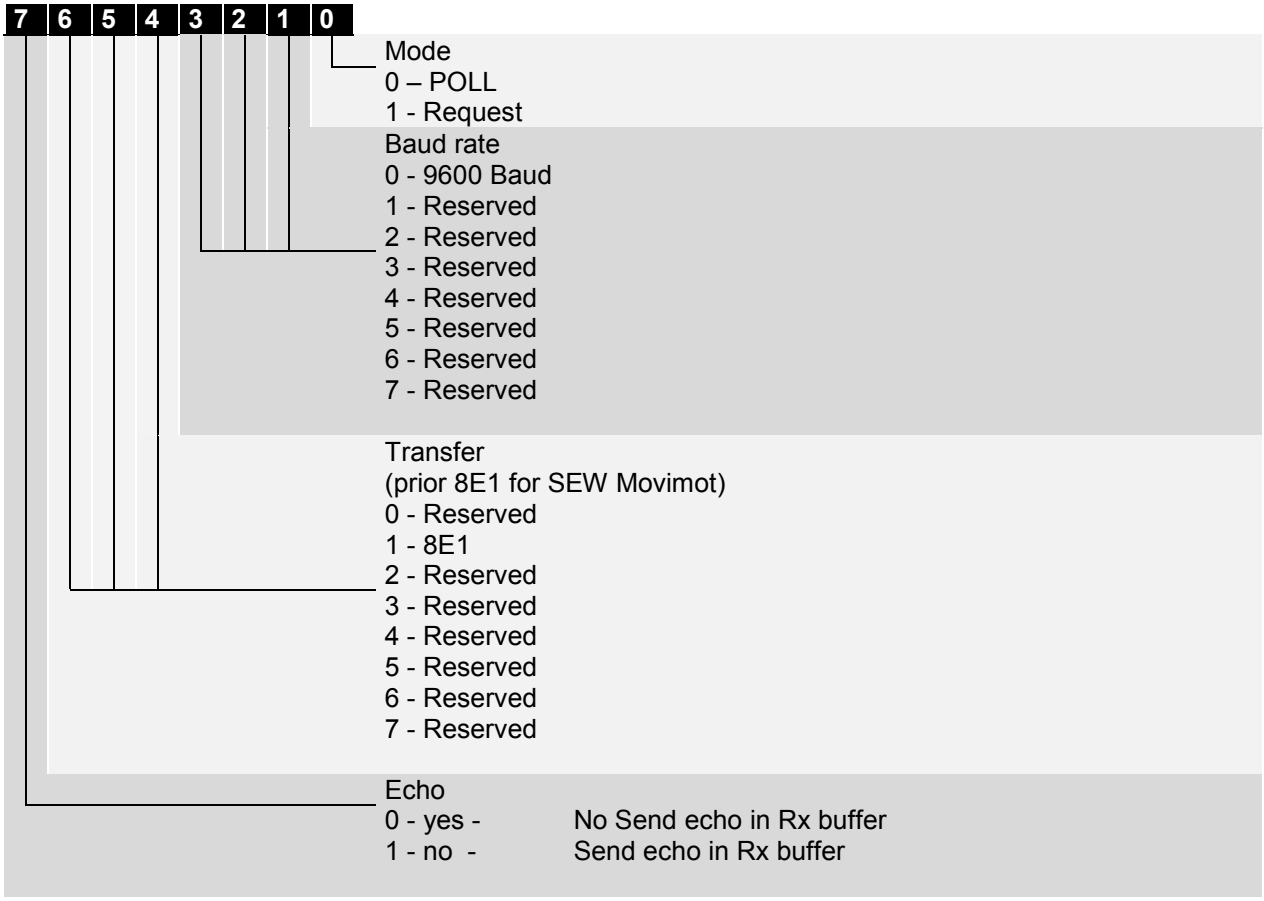
Byte 0: Function Channel 00,01,10,11


7 6 5 4 3 2 1 0
Channel 00:
0 – 0V = 0 (off) , 24V = 1 (yellow)
1 – 0V = 1 (off) , 24V = 0 (yellow)
2 - 0 = 0V (off) , 1 = 24V (yellow)
3 - Reserved
Channel 01:
0 – 0V = 0 (off) , 24V = 1 (yellow)
1 – 0V = 1 (off) , 24V = 0 (yellow)
2 - 0 = 0V (off) , 1 = 24V (yellow)
3 - Reserved
Channel 10
0 - 0V = 0 (off) , 24V = 1 (yellow)
1 - 0V = 1 (off) , 24V = 0 (yellow)
2 - 0V = 1 (rot + Diag.tel.) , 24V = 0 (off)
3 - 0 = 0V (off) , 1 = 24V (yellow)
Channel 11
0 - 0V = 0 (off) , 24V = 1 (yellow)
1 - 0V = 1 (off) , 24V = 0 (yellow)
2 - 0V = 1 (red + Diag.tel.) , 24V = 0 (off)
3 - 0 = 0V (off) , 1 = 24V (yellow)

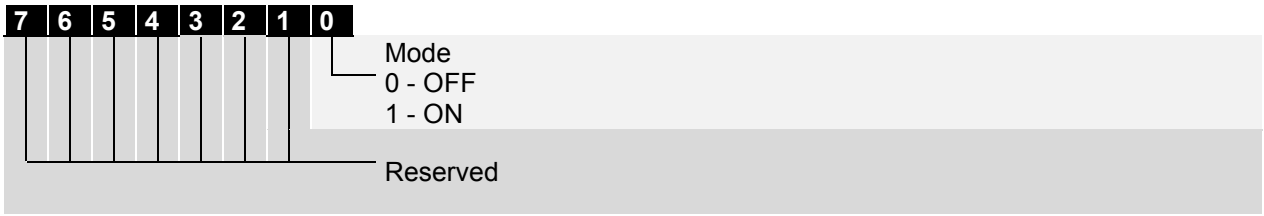
Byte 1: Safe status output 00,01,10,11


7 6 5 4 3 2 1 0
Channel 00
0 –0 V if DP or ICAN disturbed
1 – 24 if DP or ICAN disturbed
2 – Maintain current state
3 - Reserved
Channel 01
0 –0 V if DP or ICAN disturbed
1 - 24 V if DP or ICAN disturbed
2 – Maintain current state
3 - Reserved
Channel 10:
0 –0 V if DP or ICAN disturbed
1 - 24 V if DP or ICAN disturbed
2 – Maintain current state
Channel 11:
0 –0 V if DP or ICAN disturbed
1 - 24 V if DP or ICAN disturbed
2 – Maintain current state

Byte 2 Settings RS485 Byte 0



Byte 3 Settings RS485 Byte 1



Byte 4 XOFF Time out

Byte 5 Send delay

6.6.3 Logic E 4xM12 – Art.No. 56771

6.6.3.1 Identification

Description	Art.No.	Process data		Identification
		Input	Output	
Logic E 4xM12	56771	1 Byte	-	42 $_{hex}$00 $_{hex}$DD $_{hex}$ C3

6.6.3.2 I/O – Data

6.6.3.2.1. Input Data IDM

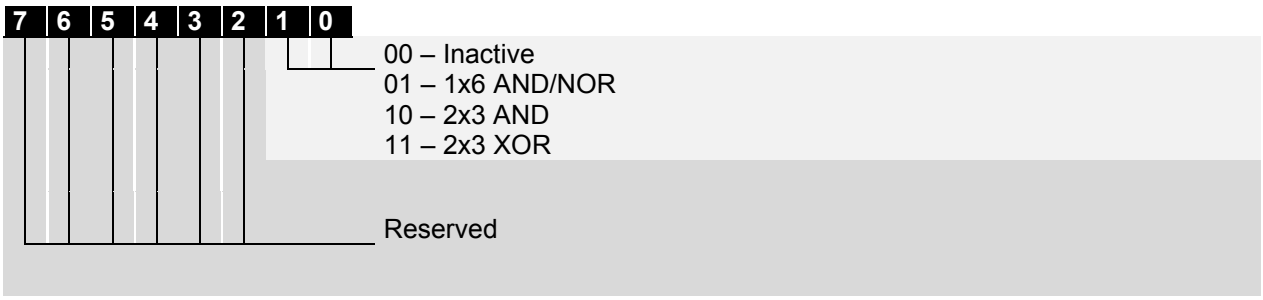
Byte 0								
Bit	7	6	5	4	3	2	1	0
Channel	Output S4	Output S2	Input Socket 2 Pin 4	Input Socket 2 Pin 2	Input Socket 1 Pin 4	Input Socket 1 Pin 2	Input Socket 0 Pin 4	Input Socket 0 Pin 2

6.6.3.3 Parameter bytes

Byte	Signification
0	Settings Logic

6.6.3.4 Bit assignment of Parameter bytes

Settings Logic



1x6 AND/NOR:

Function	Pin 2			Pin 4			Output	
	DI1	DI 3	DI5	DI2	DI4	DI6	S2	S4
1x6 AND/NOR	1	1	1	1	1	1	1	0
	0	0	0	0	0	0	0	1
	any other state						0	0

2x3 AND:

Function	Pin 2			Pin 4			Output	
	DI1	DI 3	DI5	DI2	DI4	DI6	S2	S4
2x3 AND	1	1	1	x	x	x	1	x
	x	x	x	1	1	1	x	1
	any other state						0	0

2x3 XOR:

Function	Pin 2			Pin 4			Output	
	DI1	DI 3	DI5	DI2	DI4	DI6	S2	S4
2x3 XOR	1	1	1	0	0	0	1	0
	0	0	0	1	1	1	0	1
	any other state						0	0

7. COMDRV

The COMDRV module is a virtual module. In the process map of the PLC it uses 4 bytes each in the input and output data. The I/O data allow executing a simple protocol enabling read or write actions on the storage areas of the bus node.

A specific storage area is allocated to each extended service. For information on the structure, please refer to the chapter "Extended Services". Access is made in Motorola format.

Implementation examples for various PLCs can be found under www.murrelektronik.com.

The COMDRV is required for using SAP 01 and SAP 05.

This module is supported from firmware 3.00. If it is used, it must be the last module registered in the configuration.

7.1 Identification

Art. No.	Description	Process data		Identification
		Input	Output	
-	COMDRV	4 Bytes	4 Bytes	$C1_{hex}$ 83_{hex} 83_{hex} 01_{hex}

7.2 Bit assignment I/O Data

7.2.1 Input Data IDM

Byte 0 (Status)								
Bit	7	6	5	4	3	2	1	0
Channel	ACT	ACK	BSY	ERR	SAP (Service Access Point 0..15)			

Bit	Designation	Values	Description
7	ACT	0	ComDrv is not activated or not present.
		1	ComDrv is active.
6	ACK	0	Waiting for request
		1	Request confirmed
5	BSY	0	ComDrv ready.
		1	ComDrv not ready because current process is not completed.
4	ERR	0	No error
		1	Error (Error code in Data Low)
0 bis 3	SAP	0 to 15	Service Access Point

Byte 1 (Index)
INDEX (0..255)

Byte 2 (Data_High)
DATA_HIGH

Byte 3 (Data_Low)
DATA_LOW

Error code	Designation	Signification
0	NO_ERROR	No error
1	SAP_NOTEXIST	The SAP does not exist
2	INDEX_OUTOFRANGE	Index greater than the max. Index of the SAP.
3	INDEX_READONLY	Index in SAP write-protected
4	INDEX_WRITEONLY	Index in SAP read-protected
5	ERR_READ	Internal read error
6	ERR_WRITE	Internal write error
7	ERR_PWD	Wrong password

Tabelle 7-1 Error codes

7.2.2 Output Data ODM

Byte 0 ()								
Bit	7	6	5	4	3	2	1	0
Channel	STR	R/W	B/W	RES	SAP (Service Access Point 0..15)			

Bit	Designation	Values	Signification
7	STR	0 -> 1	Start process (Write or read access)
		1 -> 0	Abort current access or no effect.
6	R/W	0	Read : read access
		1	Write : write access
5	B/W	0	Byte access
		1	Word access
4	RES	-	reserved
3 to 0	SAP	0 to 15	Service Access Point

Byte 1 ()

INDEX (0..255)

Byte 2 ()

DATA_HIGH

Byte 3 ()

DATA_LOW

The COMDRV has to be reset after every write or read access. This is done by over-writing the output data with the value 0.

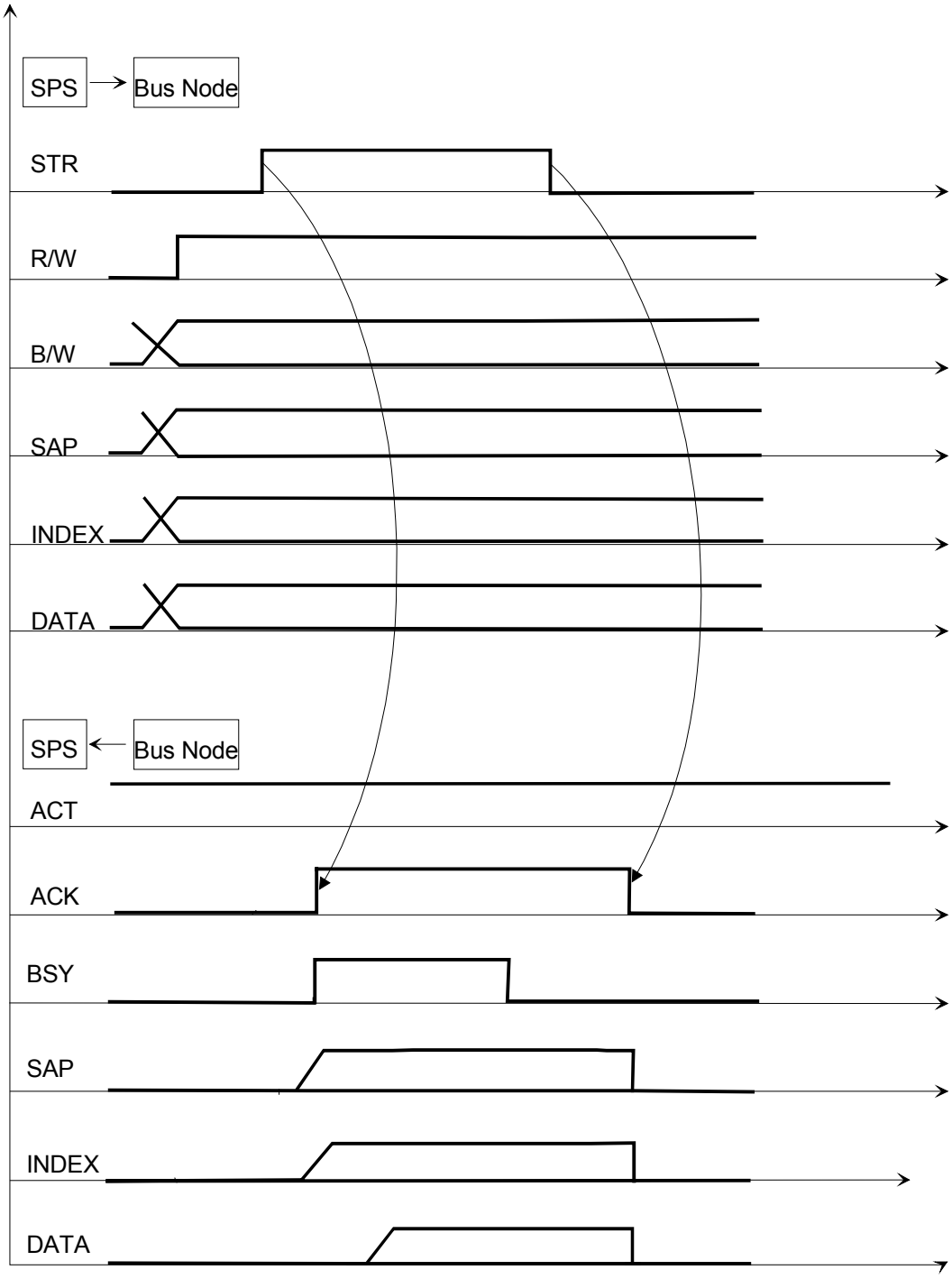


Fig. 60: Timing Read Access

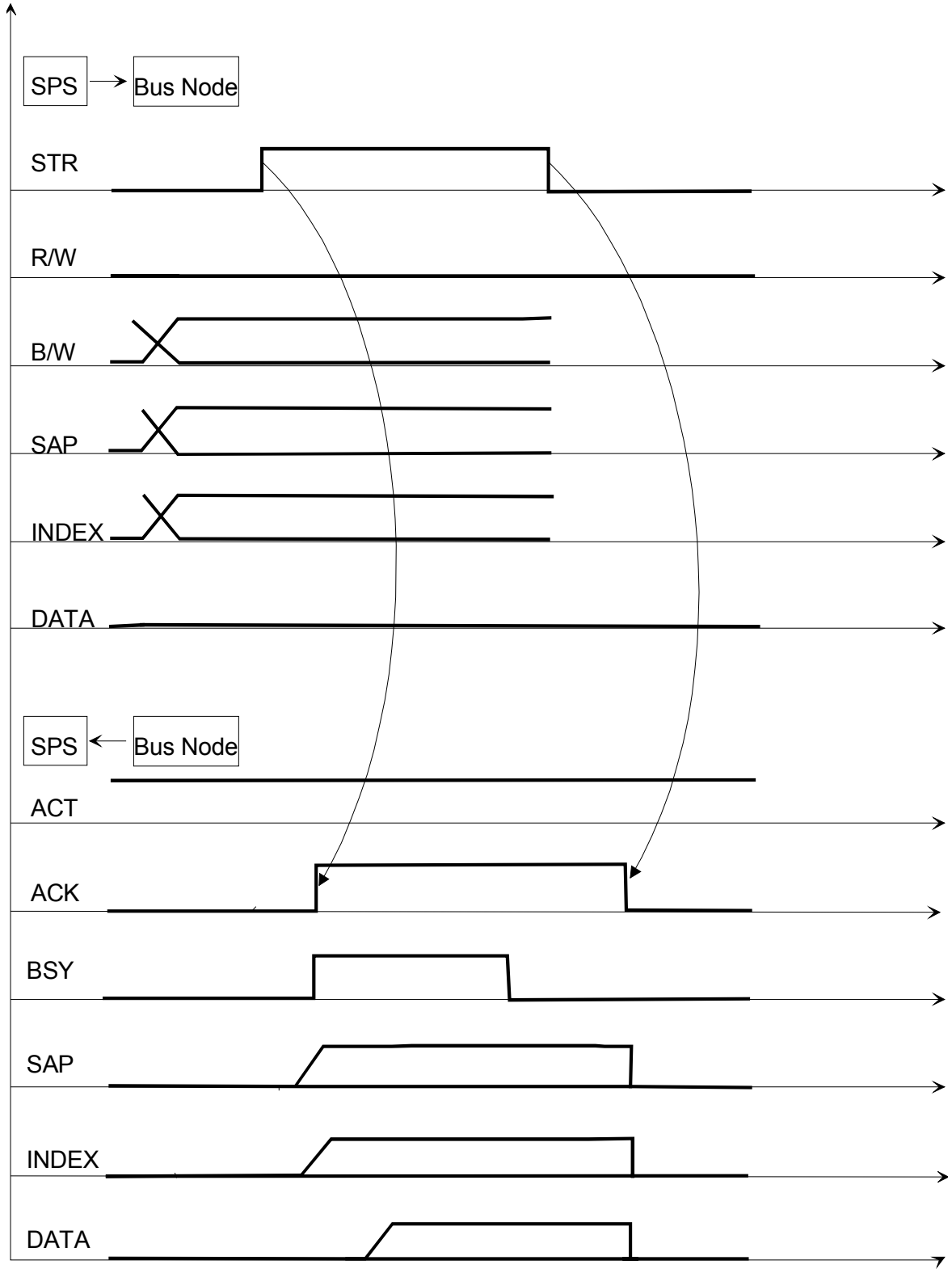


Fig. 61: Timing Read Access

7.3 Extended Functions

For examples and function blocks please refer to our homepage.

7.3.1 General Information

The bus node provides specific services for extended functions. Several data and an instruction set are assigned to a service. Each service is identified by a number, in the following described as SAP (Service Access Point).

Communication between application and service is made through a storage area allocated to the service. The storage area can be accessed via the "virtual" COMDRV module included in the GSD file from version 2.4 upwards. This module has to be the last module registered in the configuration.

The COMDRV module (see 1) uses 4 I/O data bytes, which allow to execute a simple protocol.

7.3.2 Structure of a SAP

Each SAP consists of a header (SAP INFO) shared by all SAPs and an individual area (SAP USER). The administration part globally uses the addresses 0 to 5. Addresses 6 to 255 are provided for SAP specific data. Take note that the SAPs do not use the entire address range. The max. admissible address for read or write actions is stored in the SAP header (addresses 2 or 3).

SAP Info

Index	Access	Designation	Description
0	Write	CTRL_SAP	Control SAP
1	Read only	INFO_SAP	Status SAP
2	Read only	MAX_WR_ADR	Max. admissible address for write action
3	Read only	MAX_RD_ADR	Max. admissible address for read action
4	Write	-	Reserved
5	Write	-	Reserved

Bit Assignment Index 0 – CTRL_SAP

Index	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit0
0								

The 'Control' byte allows controlling service actions. The bit assignment is SAP specific. For more details please refer to the description of the corresponding service.

Bit Assignment Index 1 – INFO_SAP

Index	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit0
1								

The 'Status' byte allows reading out the current status of a service. The bit assignment is SAP specific. For more details please refer to the description of the corresponding service.

7.4 SAP01 : Software Version Service

7.4.1 Description

This service allows reading the software version and revision of the bus node.

SAP-INFO

Index	Access	Designation	Value
0	Write	CTRL SAP	0
1	Read	INFO SAP	0
2	Read only	MAX_WR_ADR	7
3	Read only	MAX_RD_ADR	7
4	Write	Reserved	0
5	Write	Reserved	0

This service does not provide any action. Therefore, CTRL SAP and INFO SAP are irrelevant for this service.

SAP USER

Index	Access	Designation	Value	Description
6	Read	Software Version	e.g. 3	Software 3
7	Read	Software Revision	e.g. .10	Software .10

7.5 SAP05 : Machine Option Service

7.5.1 Description

Deactivates I/O modules that are not included in the actual configuration.

Requirements

- In the parameterization of the bus node the configuration check is set to "Extended".
- The connected IO modules are subsets of the max. projected configuration.

Memory Structure

SAP-INFO

Index	Access	Designation	Value
0	Write	CTRL SAP	0
1	Read	INFO SAP	0
2	Read only	MAX_WR_ADR	23
3	Read only	MAX_RD_ADR	23
4	Write	Reserved	0
5	Write	Reserved	0

SAP-USER

Index	Zugriff	Designation	Value	Description
6	Read/Write	Deact_8to15	0	Deactivation information Module 8 to 15
7	Read/Write	Deact_0to7	0	Deactivation information Module 0 to 7
8	Read/Write	PrmLength[Modul 0]	0	No. of parameter bytes for module Slot 0
9	Read/Write	PrmLength[Modul 1]	0	No. of parameter bytes for module Slot 1
10	Read/Write	PrmLength[Modul 2]	0	No. of parameter bytes for module Slot 2
11	Read/Write	PrmLength[Modul 3]	0	No. of parameter bytes for module Slot 3
12	Read/Write	PrmLength[Modul 4]	0	No. of parameter bytes for module Slot 4
13	Read/Write	PrmLength[Modul 5]	0	No. of parameter bytes for module Slot 5
14	Read/Write	PrmLength[Modul 6]	0	No. of parameter bytes for module Slot 6
15	Read/Write	PrmLength[Modul 7]	0	No. of parameter bytes for module Slot 7
16	Read/Write	PrmLength[Modul 8]	0	No. of parameter bytes for module Slot 8
17	Read/Write	PrmLength[Modul 9]	0	No. of parameter bytes for module Slot 9
18	Read/Write	PrmLength[Modul 10]	0	No. of parameter bytes for module Slot 10
19	Read/Write	PrmLength[Modul 11]	0	No. of parameter bytes for module Slot 11
20	Read/Write	PrmLength[Modul 12]	0	No. of parameter bytes for module Slot 12
21	Read/Write	PrmLength[Modul 13]	0	No. of parameter bytes for module Slot 13
22	Read/Write	PrmLength[Modul 14]	0	No. of parameter bytes for module Slot 14
23	Read/Write	PrmLength[Modul 15]	0	No. of parameter bytes for module Slot 15

Article number	Designation	Parameter length
-	Placeholder	0
56600	Cube67 DIO16 C 8xM12	8
56601 XX	Cube67 DIO16 E 8xM12	8
56602	Cube67 DI16 C 8xM12	8
56603 XX	Cube67 DI16 E 8xM12	8
56605	Cube67 DO6 (DO6) E 6xM12 K3	4
56606	Cube67 DI16 E 8xM12 NPN	8
56610	Cube67 DIO8 C 4xM12	4
56611 XX	Cube67 DIO8 E 4xM12	4
56612	Cube67 DI8 C 4xM12	4
56613	Cube67 DI8 E 4xM12	4
56616	Cube67 DI8 E 4xM12 NPN	4
56620	Cube67 DI8 C 8xM8	4
56621 XX	Cube67 DIO8 E 8xM8	4
56622	Cube67 DI8 C 8xM8	4
56623	Cube67 DI8 E 8xM8	4
56626 XX	Cube67 DI8 E 8xM8 NPN	4
56631	Cube67 DIO8 E 4xM12 1A	4
56640	Cube67 DIO16 C 8xM12 1,6A	8
56641	Cube67 DIO16 DO16 E 16xM12 (1,6/2A)	13
56600 1	Cube67 DO16 E Valve CPV 1,4m	4
56600 2	Cube67 DO32 E Valve 0,5A mit 2m	8
56650	Cube67 DO16 E Valve K3	4
56651 XX	Cube67 DO16 E Valve	4
56653	Cube67 DO16 E MAC (0,5A)	4
56655 XX	Cube67 DO8 E Valve	2
56656 XX	Cube67 DO24 E Valve	8
56656 XX	Cube67 DO23 E Valve	8
56656 XX	Cube67 DO22 E Valve	8
56656 XX	Cube67 DO32 E Valve 0,5A	8
56657	Cube67 DO32 E MAC	8
56661	Cube67 DIO8 E Cable	4
5666100	Cube67 DIO8 E Cable 2m	4
56 662	Cube67 DIO16 E Cable 0,5A	4
56600 0	Cube67 DIO8 E Cable M12 ID 1,2m	4
56663	Cube67 DIO8 E M16	4
56665 XX	Cube67 DIO8 E Cable ID	2
56 671	Cube67 DI16/DO16 E Cable 0,5A	2
56681	Cube67 DIO8/DI8 E TB Box	6
56691	Cube67 DIO8/DI8 E TB Rail	6
56700	Cube67 AI4 C 4xM12 (U)	16
56 701 XX	Cube67 AI4 E 4xM12 (U)	16
56710	Cube67 AO4 C 4xM12 (U)	16
56720 XX	Cube67 AO4 C 4xM12 (I)	16
56730 XX	Cube67 AI4 C 4xM12 (I)	16
56740 XX	Cube67 AI4 C 4xM12 RTD	5
56748 XX	Cube67 AI4 C 4xM12 TH	5

Article number	Designation	Parameter length
56750	Cube67 CNT2 C 4xM12	13
56760	Cube67 DIO4 RS485 E 3xM12	6
56771	Cube67 Logic E 4xM12	1

Tab. 56: Parameter lengths of IO modules

Bit Assignment Control and Status byte

Bit Assignment Byte 0 – CTRL SAP

Byte/Index	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit0
0	-	-	-	-	-	-	-	CHK

Value	Command	Description
0	SAP05_CMD_RESET	Reset
1	SAP05_CMD_CHK	Check configuration

Bit assignment Byte 1 – INFO SAP

Byte/Index	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit0
1	-	-	-	DTX	CFG	PRM	BSY	ACK

Bit	Designation	Values	Description
0	ACK	0	Waiting for call
		1	Call confirmed
1	BSY	0	Ready.
		1	Not ready because current process is not completed.
2	PRM	0	Parameter check faulty.
		1	Parameter check successful.
3	CFG	0	Parameter check faulty.
		1	Parameter check successful.
4	DTX	0	Bus node status DATA_EX(0)
		1	Bus node status DATA_EX(1)

DATA_EX(0) : Profibus-Data_Exchange. No I/O data exchange with I/O modules.

DATA_EX(1) : Profibus-Data_Exchange. I/O data exchange with I/O modules.

Bit assignment Byte 6 and 7 : Deact_8to15 and Deact_0to7

Byte/Index	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit0
6	Module 15	Module 14	Module 13	Module 12	Module 11	Module 10	Module 9	Module 8
7	Module 7	Module 6	Module 5	Module 4	Module 3	Module 2	Module 1	Module 0

Value	Signification
0	Module present
1	Module deactivated

7.5.2 Example

The following example illustrates the module deactivation procedure via the Machine Option Service, based on Fig. Example of a modular machine.

The max. configuration is made up of 6 modules, Art. No. 56601 DIO16 E. 8xM12.

The machine configuration only consists of the base module A, the modules installed in the machine module B are not present.

Create a table and enter the modules to be deactivated. Enter for each module the corresponding parameter length, resulting from the table. The following table can be used as an example.

Module-No.	Art.No.	Designation	Deactivated	Parameter length
0	56601	DIO16 E 8xM12	0	8
1	56601	DIO16 E 8xM12	0	8
2	56601	DIO16 E 8xM12	1	8
3	56601	DIO16 E 8xM12	1	8
4	56601	DIO16 E 8xM12	0	8
5	56601	DIO16 E 8xM12	0	8

Tab. 57: Example Actual Configuration

Tab. 58: Parameter lengths of IO modules' provides the information that has to be written into SAP 05.

Index	Access	Designation	Value	Description
6	Read/Write	Deact_8to15	0	Deactivation information module 8 to 15
7	Read/Write	Deact_0to7	$0C_{hex}$	Deactivation information modul 0 to 7
8	Read/Write	PrmLength[Module 0]	8	No. of parameter bytes for module Slot 0
9	Read/Write	PrmLength[Module 1]	8	No. of parameter bytes for module Slot 1
10	Read/Write	PrmLength[Module 2]	8	No. of parameter bytes for module Slot 2
11	Read/Write	PrmLength[Module 3]	8	No. of parameter bytes for module Slot 3
12	Read/Write	PrmLength[Module 4]	8	No. of parameter bytes for module Slot 4
13	Read/Write	PrmLength[Module 5]	8	No. of parameter bytes for module Slot 5
14	Read/Write	PrmLength[Module 6]	0	No. of parameter bytes for module Slot 6
15	Read/Write	PrmLength[Module 7]	0	No. of parameter bytes for module Slot 7
16	Read/Write	PrmLength[Module 8]	0	No. of parameter bytes for module Slot 8
17	Read/Write	PrmLength[Module 9]	0	No. of parameter bytes for module Slot 9
18	Read/Write	PrmLength[Module 10]	0	No. of parameter bytes for module Slot 10
19	Read/Write	PrmLength[Module 11]	0	No. of parameter bytes for module Slot 11
20	Read/Write	PrmLength[Module12]	0	No. of parameter bytes for module Slot 12
21	Read/Write	PrmLength[Module 13]	0	No. of parameter bytes for module Slot 13
22	Read/Write	PrmLength[Module 14]	0	No. of parameter bytes for module Slot 14
23	Read/Write	PrmLength[Module 15]	0	No. of parameter bytes for module Slot 15

Tab. 59: Example : Data range of SAP05

Now you have all the information available that have to be written into the bus node by means of the COMDRV module.

① - Step

Wait until the COMDRV module is ready. Below the map of the four input data bytes of the COMDRV module when in ready state:

Byte 0 (Status)								Byte 1 (Index)								Byte 2 (Data_High)								Byte 3 (Data_Low)							
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

ACT bit = 1 when COMDRV in ready state

② - Step

Write the values from table 5 into the data range of the SAP05 via the COMDRV. The required sequency is represented below by a write action on address 6. All other write actions are executed the same way.

Write the output data of the COMDRV with the following values:

Byte 0 (Control)								Byte 1 (Index)								Byte 2 (Data_High)								Byte 3 (Data_Low)							
STR	R/W	B/W	-			SAP		Index								Data_High								Data_Low							
1	1	0	0	0	1	0	1	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
$C5_{hex}$								07_{hex}								00_{hex}								$0C_{hex}$							

The value $0C_{hex}$ is written into Index 7 of SAP 05.

This operation may take several PLC cycles, depending on the baud rate used in the Profibus. Therefore, you have to wait until the current write action is completed before starting the next write action.

The feedback on the status of the current writing operation is received by the status byte in the input data of the COMDRV module.

The write request is confirmed by the COMDRV by ACK = 1 and BYS = 1. When the write action is completed, BSY = 0 is set. In case of an access error you will receive ERR = 1 and the error code is reported in the DATA_LOW byte.

Please note that the COMDRV module and every service have a status or control byte. These two are not identical. The COMDRV is provided in the process map of the PLC. The status or control byte of a service is not directly accessible; access is only possible via the COMDRV.

The COMDRV has to be reset after each Read/Write action. Reset is performed by setting the output bytes to zero.

Repeat the write actions until all data are registered in the SAP 05 according to the table.

Byte 0 (Control)								Byte 1 (Index)								Byte 2 (Data_High)								Byte 3 (Data_Low)							
STR	R/W	B/W	-			SAP		Index								Data_High								Data_Low							
1	1	0	0	0	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
$C5_{hex}$								**08_{hex}**								**00_{hex}**								**08_{hex}**							

Byte 0 (Control)								Byte 1 (Index)								Byte 2 (Data_High)								Byte 3 (Data_Low)							
STR	R/W	B/W	-			SAP		Index								Data_High								Data_Low							
1	1	0	0	0	1	0	1	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
$C5_{hex}$								**09_{hex}**								**00_{hex}**								**08_{hex}**							

Byte 0 (Control)								Byte 1 (Index)								Byte 2 (Data_High)								Byte 3 (Data_Low)							
STR	R/W	B/W	-			SAP		Index								Data_High								Data_Low							
1	1	0	0	0	1	0	1	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
$C5_{hex}$								**$0A_{hex}$**								**00_{hex}**								**08_{hex}**							

Byte 0 (Control)								Byte 1 (Index)								Byte 2 (Data_High)								Byte 3 (Data_Low)							
STR	R/W	B/W	-			SAP		Index								Data_High								Data_Low							
1	1	0	0	0	1	0	1	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
$C5_{hex}$								**$0B_{hex}$**								**00_{hex}**								**08_{hex}**							

Byte 0 (Control)								Byte 1 (Index)								Byte 2 (Data_High)								Byte 3 (Data_Low)							
STR	R/W	B/W	-			SAP		Index								Data_High								Data_Low							
1	1	0	0	0	1	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
$C5_{hex}$								**$0C_{hex}$**								**00_{hex}**								**08_{hex}**							

Byte 0 (Control)								Byte 1 (Index)								Byte 2 (Data_High)								Byte 3 (Data_Low)							
STR	R/W	B/W	-		SAP			Index								Data_High								Data_Low							
1	1	0	0	0	1	0	1	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
$C5_{hex}$								**$0D_{hex}$**								**00_{hex}**								**08_{hex}**							

③ - Step

Start the configuration check by writing the value 1 (Command SAP05_CMD_CHK) into the control byte of the SAP 05.

Byte 0 (Control)								Byte 1 (Index)								Byte 2 (Data_High)								Byte 3 (Data_Low)							
STR	R/W	B/W	-		SAP			Index								Data_High								Data_Low							
1	1	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
$C5_{hex}$								**00_{hex}**								**00_{hex}**								**01_{hex}**							

If the projected configuration matches the actual configuration, I/O data can be exchanged between the control and the process.

In case of a discrepancy no I/O data will be exchanged with the IO modules. The CfgF LED lights up red. The result of the check can be read out from the status byte (Index 0).

The actual configuration is once checked after a power reset.

In order to restart the configuration set the machine option service has to be reset with the comand SAP05_CMD_RESET. Please note that the system must be switched off before modifying the actual configuration.

Glossary

General Information about the Profibus

Bus segment	The electrical specification of the RS-485 interface limits the number of devices in an RS485 network to 32. If more than 32 Profibus devices have to be used, the network must be segmented by means of repeaters.
DP	Decentralized periphery. Profibus - protocol for high-speed cyclical data exchange.
Freeze-Mode	The input data of the slave are "frozen".
GAP factor	The number of bus cycles after which a DP master searches for new active devices in order to include them into the token ring. This factor can be modified in order to optimize the speed of a DP network.
GAP range	The address range, in which an active device searches for other new active devices. This range is always between the own address and the address of the next active device already in the token ring. The range from the highest address up to 127 does not belong to the GAP range.
GSD	The GSD file (electronic data sheet) describes the technical features of a Profibus product. This file is required for the configuration of a Profibus system and is provided by the manufacturer of the device.
ID number	A 16-bit number which clearly identifies a Profibus product. It is a reference to the GSD file. More than one device can have the same ID number, provided that the numbers can be written to a common GDS file. This number is allocated by the "Profibus Nutzerorganisation e.V." (Profibus users organization).
IEC 61158	Globally recognized standard for Profibus DP and FMS which supersedes the international standard EN 50170 Volume 2.
Master Class 1	The master that performs useful data traffic.
Master Class 2	Master for control, startup, and configuration tasks.
Byte	Term from IEC 61158. Corresponds to 1 byte or 8 bits.
PIO	Process image of outputs.
PII	Process image of inputs
PNO	Profibus Nutzerorganisation e.V. (Profibus users organization).
Repeater	Coupling element for signal processing between Profibus segments.
PLC	Programmable Logic Controller
Sync_mode	The output data of the slave are "frozen".
Token	The active device (master) in possession of the token can carry out data exchange with the slaves it has parameterized and configured. On completion of the data cycle, the active device passes the token over to the next active device.

Cube67 specific

Sensor short circuit	Short-circuit or overload at Pin 1 of the M12 socket causes the self-setting fuse to blow. Each M12 socket is separately fused. A red LED indicates the fault at the associated M12 socket. This fault is indicated via the DP diagnosis. The sensor supply restarts automatically after the fault is cleared. Please note the specific characteristics of analog AO modules.
Actuator cut-off	Short circuit or overload at an output causes the output to switch off. This fault is indicated to the DP master via the DP diagnosis. A red LED indicates the fault at the associated M12 socket. The output is not automatically re-enabled. The output or the actuator supply voltage mus be disabled after eliminating the cause of the fault. This clears the short circuit memory.
Actuator warning	When an output is disabled, the presence of 24V at the associated Pin of the M12 socket is detected. This is an indication of a "short-circuit" to +24V. A probable cause of this diagnosis is a faulty connection, i.e. a sensor was connected to a channel parameterized as an output. A red LED indicates the fault at the associated M12 socket. This fault is indicated to the DP master via the DP diagnosis. This fault does not affect activation of the output. it is not possible to detect an actuator warning when the output is enabled.
Undervoltage	The voltages of the sensor supply and actuator supply are metered separately. When the voltage drops below 18 V DC, a fault is indicated to the DP master via the DP diagnosis. When sensor supply undervoltage is detected, the LED labeled „US“ lights up red. When actuator supply undervoltage is detected, the LED labeled „UA“ lights up red. This diagnosis can be masked out via parameterization.
No voltage	This diagnosis is indicated to the DP master when the supply voltage drops below 12 V DC. This diagnosis can be masked out via parameterization.
External fault	This diagnosis can only be generated by an input parameterized as a diagnostic input. External fault is indicated when 0 V is present at this input. Sensors/actuators, which meet the DESINA specification are supported. Alternatively, the line can be monitored for open circuit by using a diagnosis adapter.

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